

OCTOBER 1961

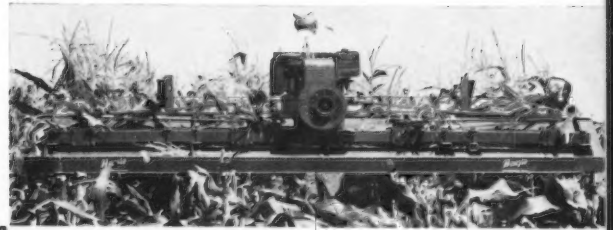
# Agricultural Engineering



The Journal of the American Society of Agricultural Engineers

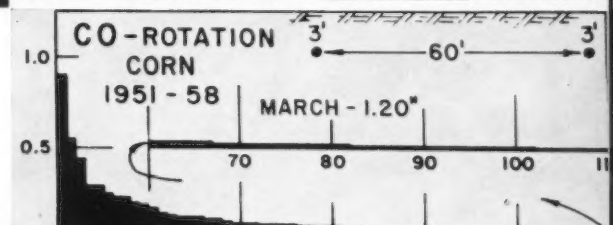
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Prior to Harvest**

**542**



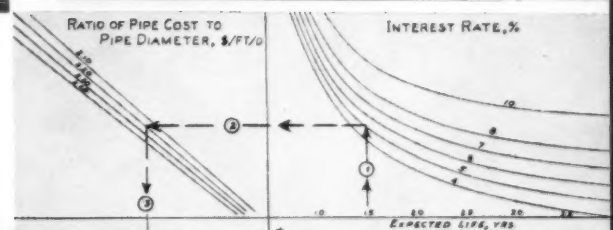
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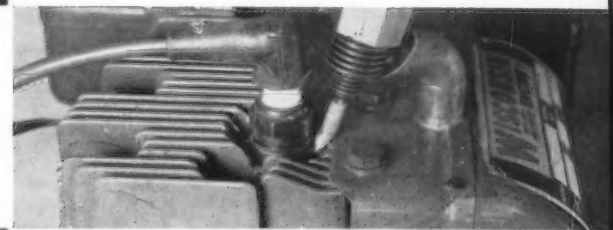
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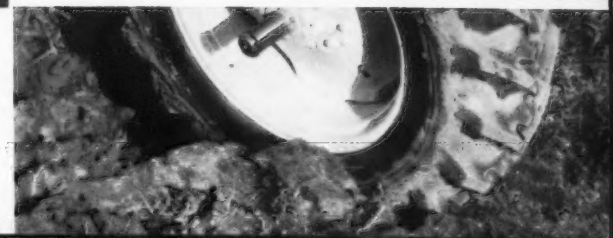
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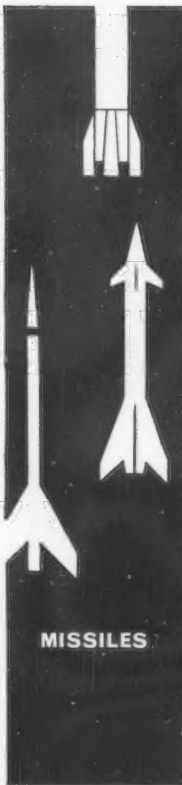


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## NEW DEPARTURE PRODUCT INFORMATION



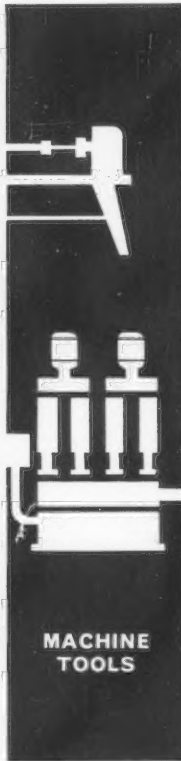
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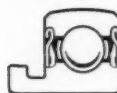
NEW SENTRI-SEAL

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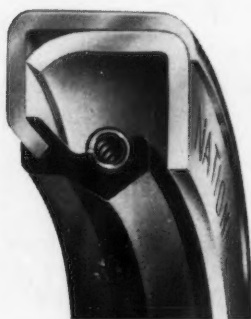
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# Agricultural Engineering

Established 1920

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## ASAE Adds Technical Coordinator

PAGE L. BELLINGER, associate editor of *Successful Farming* magazine, has accepted the newly created position of Technical Coordinator of ASAE. He will assume his new assignment October 30. Authorization for the



Page L. Bellinger

new position was given by the Board of Directors during the Annual Meeting in June. Briefly his responsibilities will be that of coordinating the technical functions of the Society. Further description of his duties appears in the executive secretary's column, "Check Points," on page 510 of the September issue.

A native of Michigan, Page was born September 28, 1930, in Rosebush. He graduated from Mt. Pleasant (Mich.) High School in 1948 and attended Central Michigan University for one year before transferring to Michigan State University. In 1958 he received a B.S. degree and in 1960 an M.S. degree in agricultural engineering—both from Michigan State University.

He has a farming background high-lighted by a father-son partnership in dairy and general farming in central Michigan, Isabella County.

In 1950 he enlisted in the U.S. Coast Guard and served aboard the USCGC Campbell. His assignments took him to California, New York, Connecticut, Louisiana, and the North Atlantic. He was honorably discharged as a second class petty officer in 1953.

Prior to college enrollment in 1954, he worked as a traffic dispatcher-clerk for Roosevelt Oil and Refining Corp. After completing his M.S. requirements, he joined the *Successful Farming* magazine staff as associate editor in January 1960. In this position, his responsibilities included planning editorial subject matter in the area of buildings, machinery, materials handling, and safety. His agricultural engineering background was used to assist him in recognizing significant problems in various agricultural areas and then organizing editorial approaches to discuss solutions based on information gained from personal contacts in the field. Assignments enabled him to associate with both farmers and agricultural engineers wherever material was available. In addition to writing his own material, he also rewrote and edited copy from other sources. His work provided an opportunity to become familiar with commercial agricultural products, as well as to make contacts with industrial and university representatives and farmers throughout the midwest.

He is married and has two sons—one two years old and one five months. Included in his outside interests are hunting, fishing, and golfing.

## AE Exposition Report

Latest details on Agricultural Engineering Exposition refer to page 545.



## Terra-Tires solved problems on this equipment— How can they help you in your design?



**Problem: MOBILITY**

**Solution:** Terra-Tires by Goodyear. Their wide tread, low inflation pressures and high flotation let this truck, owned by Shell Oil Company, easily pull free of a deep bog during an oil exploration.



**Problem: FLOTATION**

**Solution:** Terra-Tires by Goodyear. An Indiana company put Terra-Tires on this scraper to prevent delays caused by equipment miring down. Result: Faster peat harvesting at lower cost.



**Problem: NON-COMPACTION**

**Solution:** Terra-Tires by Goodyear. A racetrack that's uneven can damage thoroughbreds' legs, so Santa Anita uses tractors with Terra-Tires to condition track after a rain without compacting ground.



**Problem: CARGO PROTECTION**

**Solution:** Terra-Tires by Goodyear. Bananas bruise easily, so United Fruit "floats" its fruit from farm to railhead on equipment fitted with Terra-Tires, which also permit all-season hauling.



If you're designing a "go-anywhere" vehicle — or one that must baby its cargo or the ground it goes on—Terra-Tires by Goodyear should be a part of your design. They're available in a wide range of sizes and treads. Let us know what you're driving at—or on—or over, we'll be glad to suggest a design to solve your problem. Write Goodyear, Aviation Products Division, Dept. J-1740, Akron 16, Ohio, or Los Angeles 54, California.

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# GOODYEAR

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Rome Model TRCH 10-36 Hinge Type Offset Disc Plowing Harrow equipped with Ingersoll Dura-Notch Discs

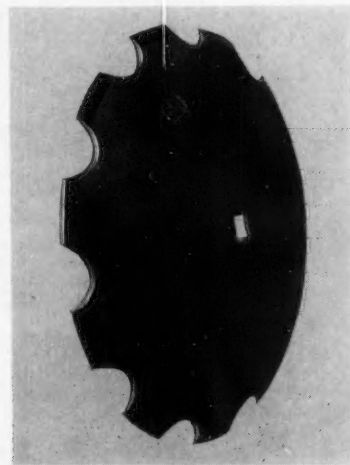
## "Not previously turned under successfully by any other equipment"

That's the nutshell story behind this job of cutting 8 to 10 inches deep in very heavy rice stubble. It's the story of heavy duty equipment—a big, brawny Rome Model TRCH Hinge Type Offset Plowing Harrow equipped with husky, king-size Ingersoll Dura-Notch® Discs.

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So look for this  mark of quality on the original equipment and replacement discs you get from your implement maker. It's the mark of genuine Ingersoll Dura-Notch discs, stamped in the side of every blade.



# Ingersoll Discs

**INGERSOLL PRODUCTS**

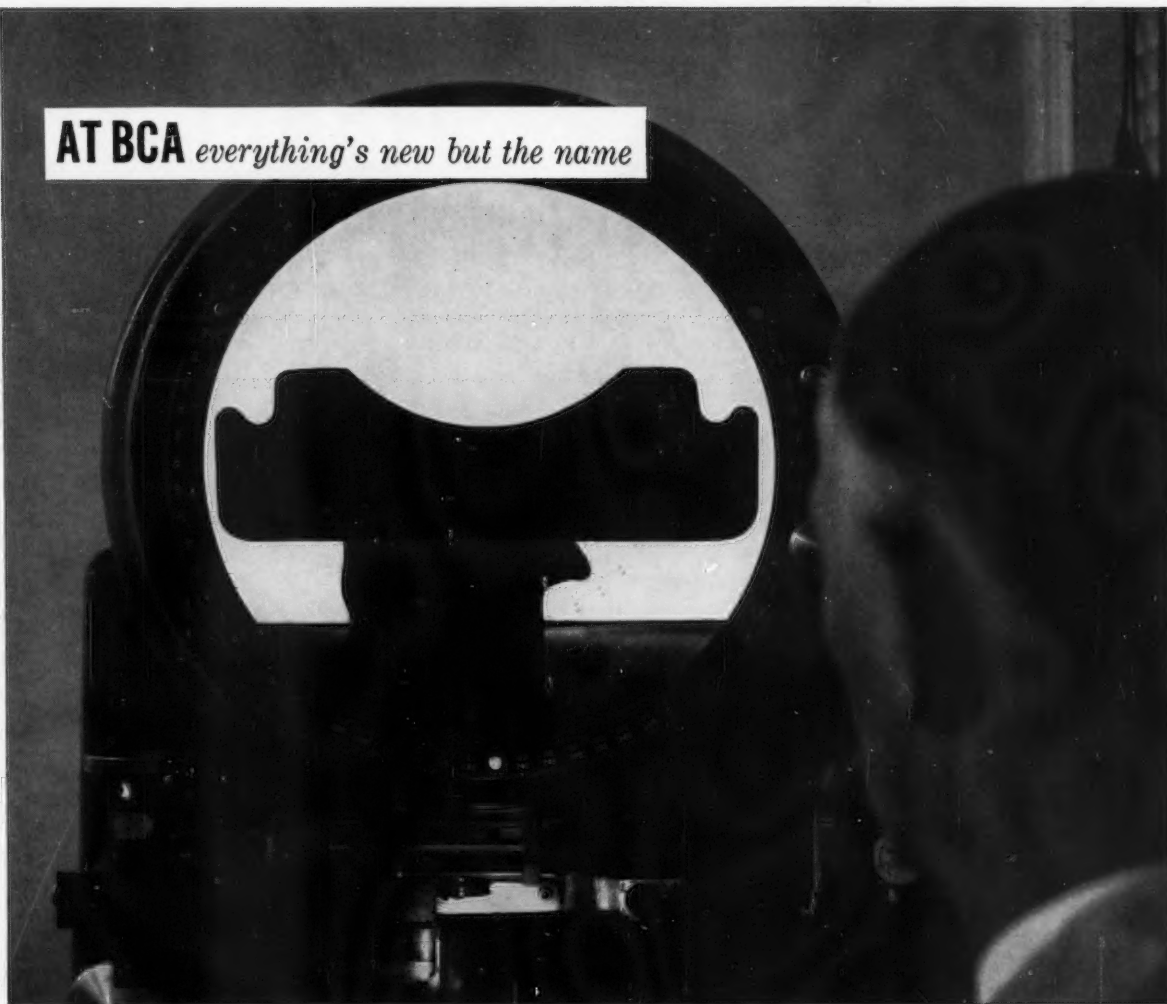
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## **BIG PICTURE—100 TIMES ACTUAL SIZE—** checks ball bearing geometry

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This contour projector provides essential information for BCA research in developing new and modified bearing designs. It also evaluates the production performance of precision tools and machine set-ups by checking the profiles of production raceway rings against precise design specifications. This device is only one of many BCA quality control measures that help assure uniformly high ball bearing quality.

New BCA laboratory facilities also include a variety of specially designed testing machines that simulate actual or exaggerated operating conditions. On this equipment, bearings are studied under exact operating conditions of the customer's application . . . and tested to *exceed* his specifications.

BCA ball bearings for original equipment as well as replacement use are made in a complete range of types and sizes. They serve practically every kind of industry . . . automotive, machine tool, construction and agricultural equipment, to name a few. For complete information, for experienced engineering counsel on bearing applications, contact: Bearings Company of America, Division of Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.



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OF AMERICA**

ball  
bearings

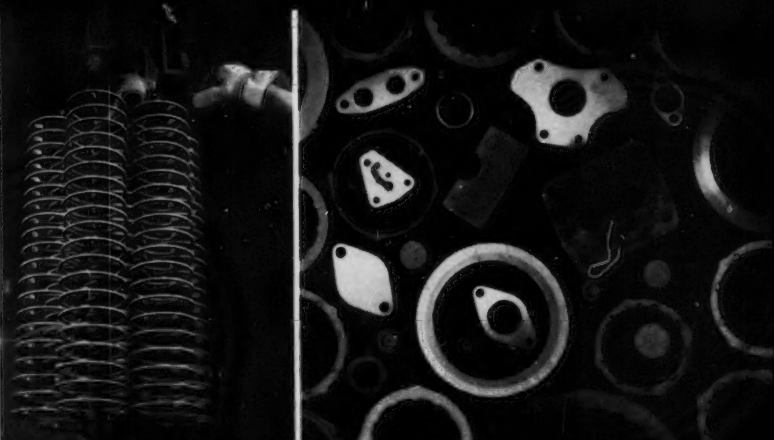
DIVISION OF  
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BEARINGS, INC.

FROM AMERICA'S LEADING PRODUCER OF PISTON RINGS...

# PERFECT CIRCLE PRECISION CASTINGS

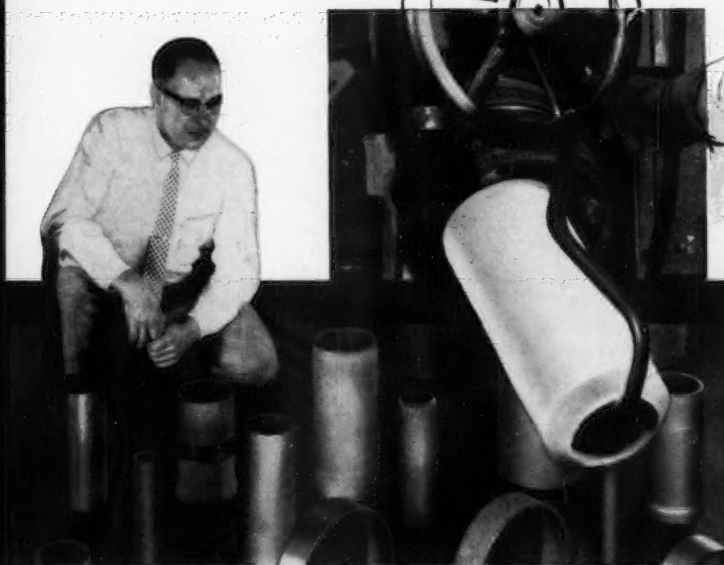
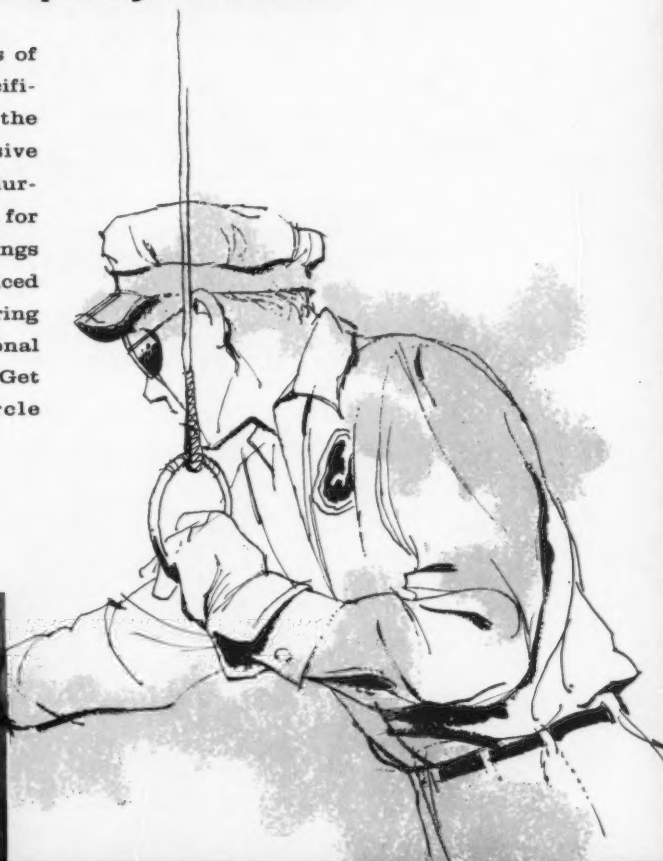
## STACK-MOLD CASTING

Molds of carefully-controlled green sand are made from the pattern plate, and stacked for pouring. In the example shown at right after shake-out, the castings are 6-up in a stack 20 molds deep. Typical castings produced by this Perfect Circle process include piston rings, thrust plates, valve lifter facings, and piston groove inserts.



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## Report to Readers . . .

### RESEARCHERS DEVELOP STEAM BLADE TO STERILIZE AGRICULTURAL SOILS

University of California agricultural scientists are cooperating with a local manufacturer in the development of a steam blade for sterilizing field soils. Preliminary models of such a blade are expected to be available next year from a local manufacturer. . . . A local commercial flower producer built a self-propelled steam blade that is mounted on a wheel tractor. With this unit field soils to be planted to carnations and chrysanthemums have been sterilized to depths of 10 to 12 inches, and at speeds of 7 to 10 inches per minute. . . . Another grower mounted a 12-foot-wide blade on a track-type tractor with low gear reduction. This unit has sufficient power to pull the steam blade at depths of 12 to 18 inches and at rates of 7 to 12 inches per minute. . . . The U of C research team cooperating in these studies includes both plant pathologists and agricultural engineers.

### NEW CHEMICAL LINER SEALS LEAKY IRRIGATION CANALS

A major objective in the efforts to prevent water waste in the USA dry West is to find ways to water-proof irrigation canals and ditches at a bearable cost. Federal and state reclamation and irrigation agencies have for many years conducted programs to reduce the waste from leaky canals, ditches and reservoirs - and with savings in the cost of such works and in acre-feet of water amounting to many millions of dollars. But this still falls far short of actual needs. . . . Now a research organization has developed a new chemical liner that, when applied to the bottom and sides of a canal, resembles white asphalt. This milklike substance, when simply flowed into the water, sinks to the bottom coating the surface with which it comes in contact. When this product was applied to one test canal on a federal project, that lost almost 75 percent of the water entering at the upper end, it reduced this loss to about 25 percent within two days after application. . . . The lasting effect of the application and over-all cost of this new liner have yet to be evaluated; however, it is to continue under study.

### PRIVATE AIR BATHS INCREASE COMFORT FOR FARROWING SOWS

At the Iowa SU swine nutrition farm a research team of swine nutritionists and agricultural engineers is experimenting with "zone" ventilation to provide more comfort for farrowing sows. In the system used, ten farrowing pens are connected by a single fresh-air duct. A small blower and an adjustable pipe are mounted on the duct above each sow's head. In warm weather the pipe is directed downward which permits the sow to bathe in the fresh air when standing, yet escape it when she lies down. In winter the pipe is directed upward to keep the chilled air off sow and pigs. Compared with exhaust-fan ventilation, zone-ventilated sows were comfortable up to temperatures of 80 to 85 F. . . . The engineers are now trying to find out how well zone ventilation will perform, with mechanically cooled air, when outside air is above 85 F. It is at this level where they believe air conditioning may pay off.

### TILE DRAINS PROVE BEST IN POORLY DRAINED FARM SOILS

From field research studies in the northern part of their state, Michigan AES agricultural engineers found that lines of field tile did a better drainage job on poorly drained clay soils than either mole drains or bedding. The usual practice of bedding poorly drained soils in the area gave little or no yield increase for grain, but did give moderate increase for hay. . . . An average yield increase of 11 bushels per acre of winter wheat resulted from the tiling as compared with conventional practice. Oats and first-year and second-year hay also showed comparable increases.

(Continued on page 530)

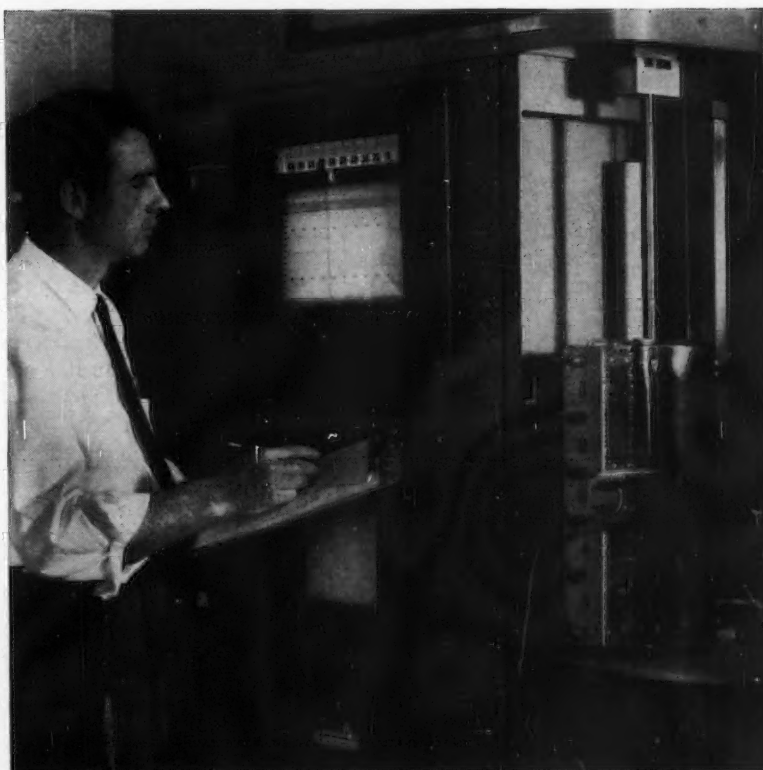


## TESTING PUTS THE HEAT ON—HELPS BEARINGS BEHAVE IN EXTREME ENVIRONMENTS

In industry today, bearing operating conditions are becoming increasingly severe. To conquer difficult environments, heat, corrosion and oxidation, Bower conducts exhaustive research to achieve improved bearing performance. One important area of Bower research, for example, is the development of special alloys to withstand extreme heat. To do this, Bower researchers use special heating apparatus to study hardness, strength and other characteristics of alloys at temperatures in excess of 1000°F.

One of the devices Bower utilizes to assure bearing precision at high temperatures is a creep tester. Bower engineers use it to load a test bar to a predetermined stress level, then, with the assistance of a special heating unit, find out precisely how much the bar stretches as temperatures are elevated to a thousand degrees F., and beyond.

With this type of data and the help of other Bower precision research equipment, engineers can determine alloys that best withstand torrid temperatures. They can also effectively mate thermal expansion characteristics of the various alloys used in roller bearing components and in shafts and housings as well. As a result of this mating, Bower creates bearings that maintain precision in the required temperature ranges and ensures bearings that provide long life, heavy load capacity and high-speed operation. Because of Bower's continuing research



Bower engineers study how alloys stretch as temperatures rise in excess of 1000°F., to perfect bearings that can take it.

in bearing alloys and other critical areas, we suggest you consider Bower to assist you with your bearing needs. Bower provides a full range of types and sizes

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### . . . Report to Readers (Continued from page 528)

#### RESEARCHERS CONDUCT STUDY OF ANAEROBIC DIGESTION OF MANURE

The Iowa SU nutrition and agricultural engineering research team, now conducting tests on the growing and finishing of swine, will also include a civil engineer. This engineer will conduct studies of the anaerobic digestion of manure in the manure-disposal system that is used in the new all-confinement, growing-finishing unit. This part of the study is directed toward finding possible new and improved means of disposing of animal wastes in the interest of public health.

#### POULTRYMAN AS HIS OWN THERMOMETER DURING SUMMER PRODUCTION OF EGGS

Poultry science and agricultural engineering researchers at Auburn U have reported significant findings from a study of the relation of summer heat stresses to egg production. From this study they have deduced that the chicken, like the camel, is able to "load" heat during a hot day and "unload" it during the cooler night. Chickens can, therefore, survive and produce much better if hot days are followed by cool nights. . . From Auburn research results it would seem that some concepts of heat stress in poultry need revising. These results indicate that laying White Leghorn pullets will produce adequately in temperatures as high as 80 F. The researchers say also that since a man not exerting himself in heavy work begins to perspire at about 80 F, the poultryman can serve as his own thermometer - and take the steps necessary to moderate the temperature for the laying birds.

#### MORE ACCURATE RAINFALL-RUNOFF DATA SOUGHT FROM SMALL WATERSHED AREAS

Michigan SU agricultural engineers are cooperating in a research study to remedy the lack of information which they say is needed on rainfall intensity, duration, frequency and resulting runoff on small agricultural drainage basins in the state. Though U.S. Weather Bureau rainfall records go back 100 years, the Bureau's stations are 20 to 30 miles apart, with the result that many intense storms pass between the stations without revealing the actual rainfall pattern. . . . Since most summer rainfall comes from showers and thunderstorms, large amounts of water are dumped on a scattered pattern in a short period of time. It is such large runoffs that can quickly overload drainage systems. . . . The rainfall and runoff data to be obtained from the Michigan studies will prove valuable in the design of all types of water-control facilities for serving small watersheds, including drainage, irrigation, flood control and storm sewer design.

#### RADIO-FREQUENCY ENERGY SPEEDS GERMINATION OF ALFALFA SEED

A USDA agricultural engineer reports that, in laboratory tests he conducted, 95 percent of alfalfa seed containing a high proportion of hard seed germinated after being treated for 28 seconds with radio-frequency energy, at a frequency of 39 megacycles per second and a field intensity of 3,000 volts per inch. In tests of the identical untreated alfalfa seed, only 60 percent of the seed germinated. The test showed further that storing of the treated seed for two years failed to alter the ability to germinate which it had acquired. . . . This study showed that exposure to radio-frequency energy not only heats the seeds and chemically changes the sugars of certain varieties, but also increases the capacity of some hard seeds to absorb water. The latter seems a likely cause of increased germination. This research study is being continued to learn if radio-frequency energy has practical use in seed processing. . . . Previous experiments have demonstrated that certain insect pests in stored grain can be killed by radio-frequency energy, but its use for this purpose is still too expensive to be commercially justified. Another possible application of radio-frequency energy is for selectively killing weed seeds in crop seeds. While enough of this energy will kill any seed, it has not been accurately determined whether any kinds of weed seeds are more susceptible to damage from such treatment than are crop seeds.

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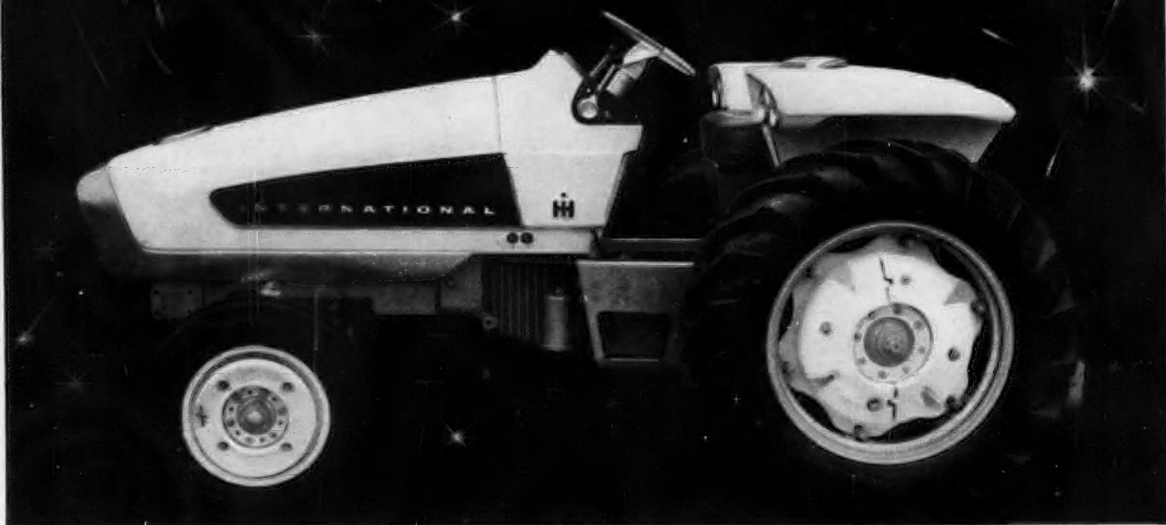
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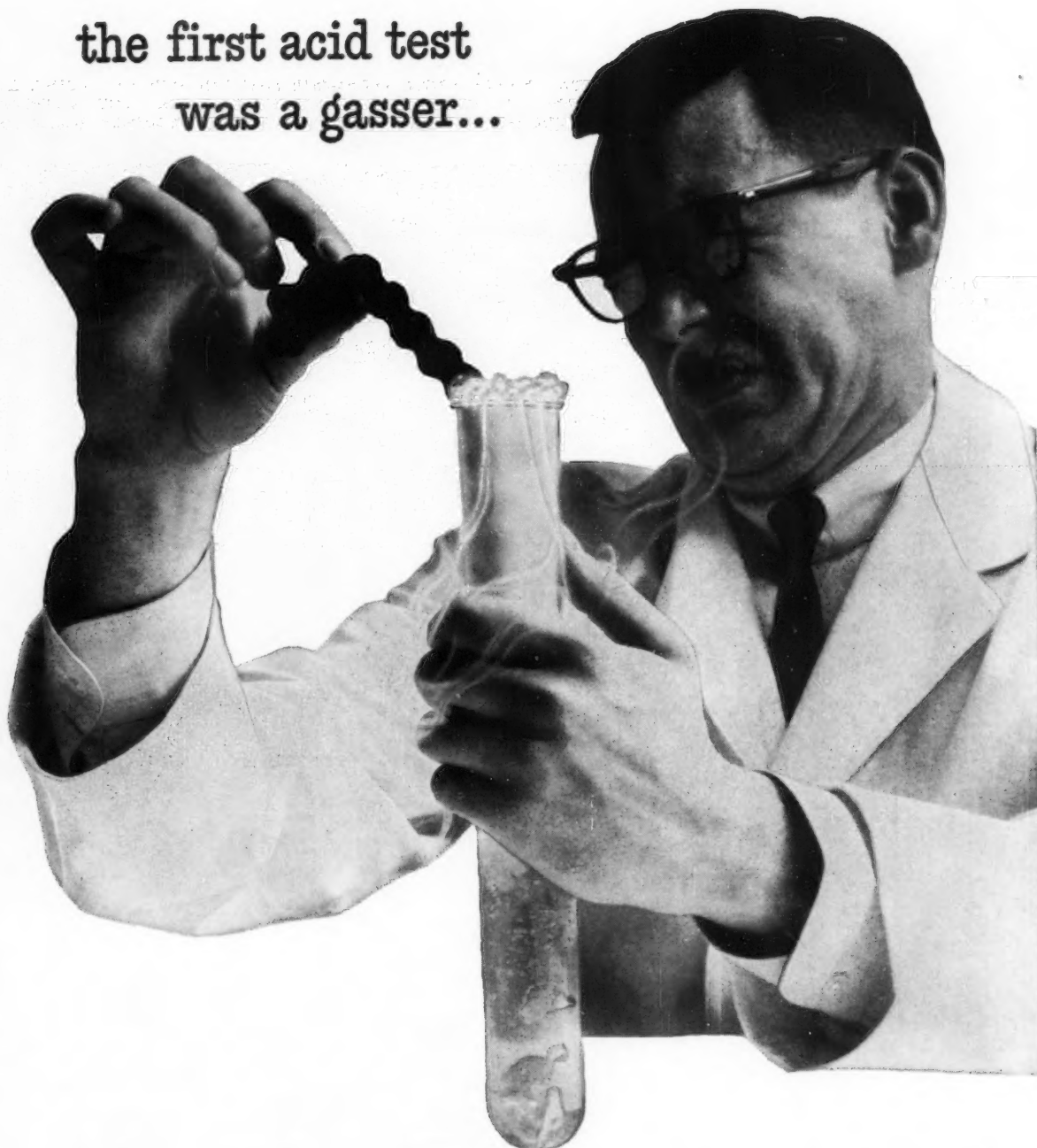
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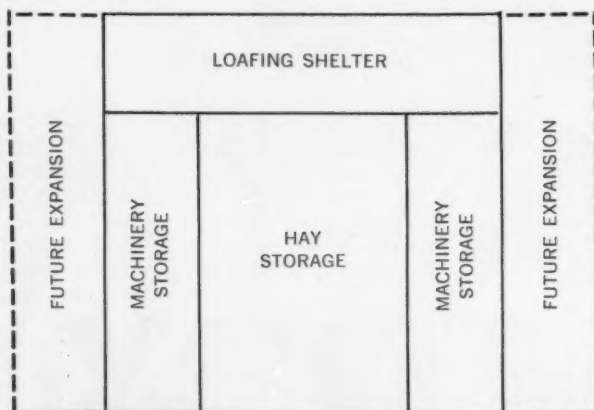
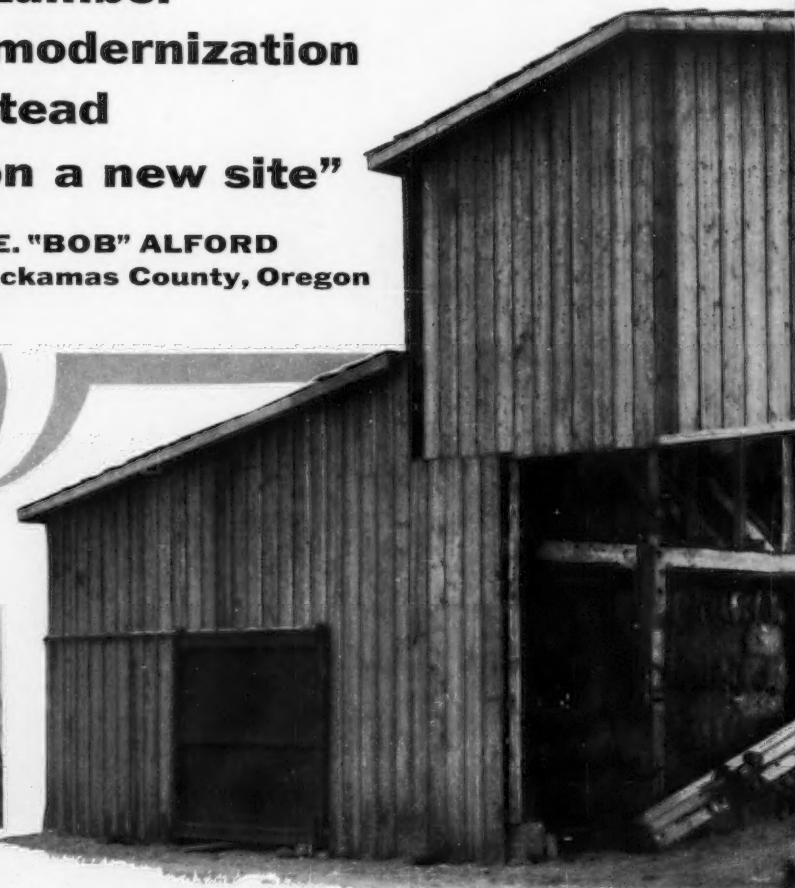
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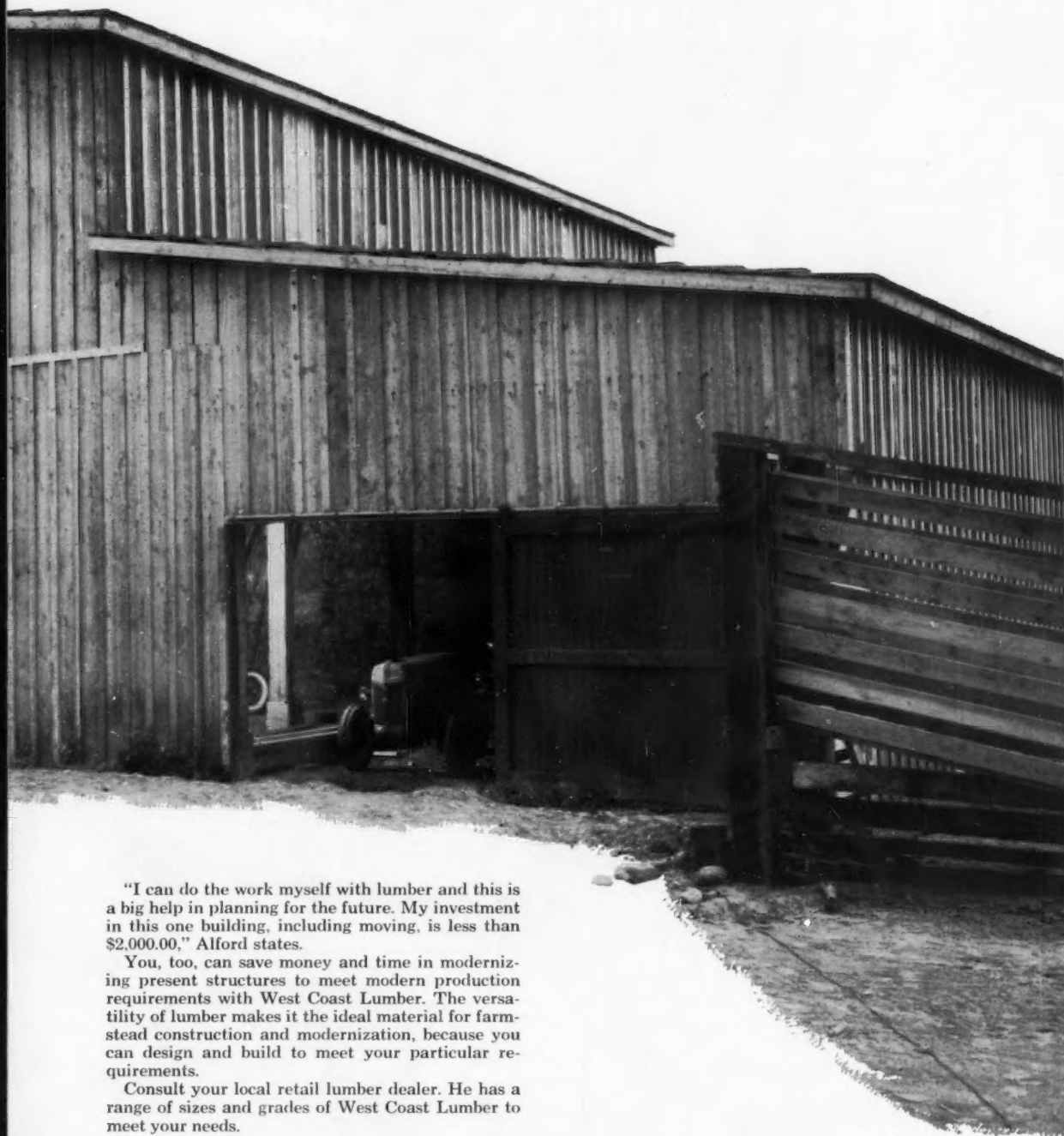
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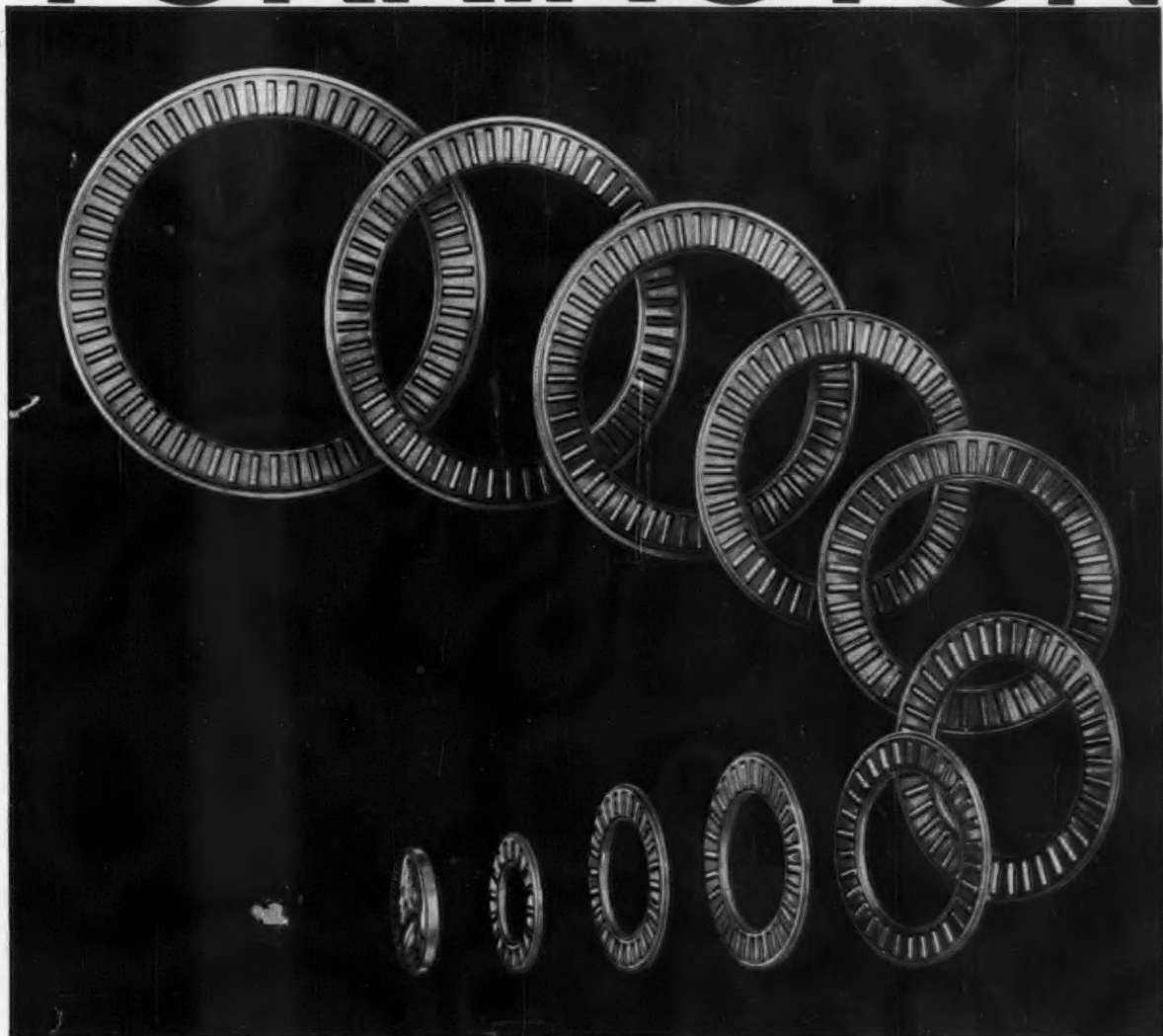


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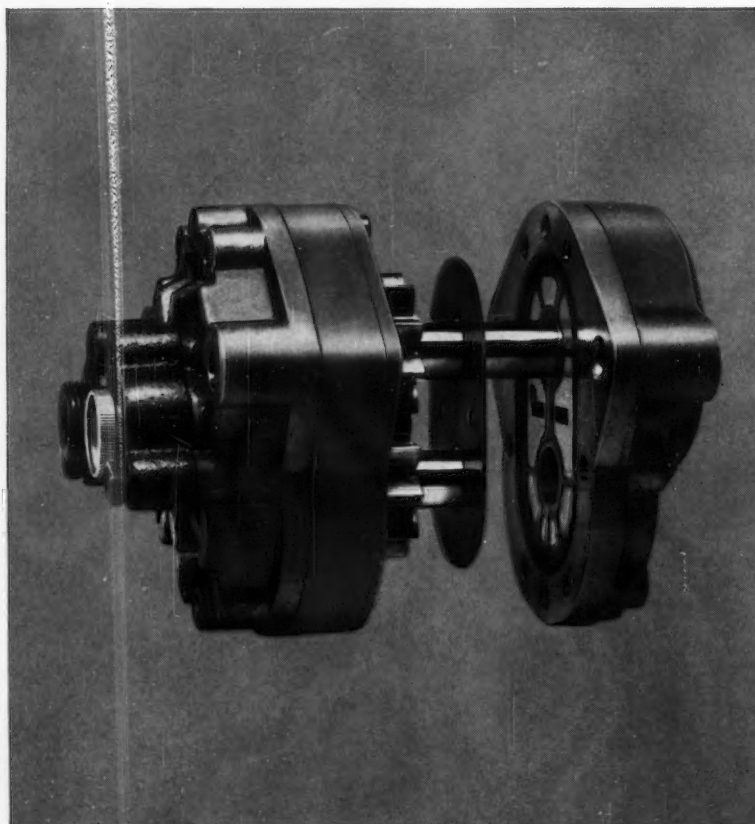
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# Agricultural Engineering

October 1961  
Number 10  
Volume 42

James Basselman, Editor



A. W. FARRALL

President-Elect of ASAE and head,  
agricultural engineering dept.,  
Michigan State University

**A**GRICULTURE of today functions in a changing world. During the early 1800's about 85 percent of the people in the United States lived on farms and were largely self-sufficient. Each family produced its food and fiber, did its own canning, stored its own potatoes, etc., and usually spun wool "or cotton" to make the materials to clothe the family. In other words, agriculture as carried on by the farmer in those days covered the broad areas of production, storage and processing. The surplus went to the cities; however, this was a small percentage of the whole.

As our country became more industrialized and as agriculture began to be mechanized and farm units became larger, gradually most products of agriculture began to be processed off the farm. Today less than 10 percent of our people produce, on the farm, all the products of agriculture, while the processing of these products has moved almost entirely to factories and processing centers. At the same time, nearly 40 percent of our wage earners in the cities are engaged in food or fiber production, processing or distribution.

Since World War II, the percentage of women working in industry has increased tremendously, and this together with other developments has meant that the products of agriculture today are not only basically processed, but many of them have what we call "built-in maid service," for example, frozen pies, frozen dinners, etc.

Agricultural engineers, since they became a distinct professional entity in the early

Presented as Paper No. 61-304 at the Annual Meeting of the American Society of Agricultural Engineers at Ames, Iowa, June 1961, on a program arranged by the Electric Power and Processing Division.

## Total-Agriculture Concept of Agricultural Engineering

*Some new and challenging horizons for the profession*

part of this century, have applied their energies mostly in the production phases of agriculture. Even here however, most agricultural engineers serve agriculture indirectly through off-the-farm work, such as the design and development of farm equipment, and in teaching, research and extension activities in state and federal agencies.

The profession of agricultural engineering will need to give increasing attention to adjusting itself to the changing picture in agriculture, to grow, prosper and be of maximum service. It will need to adjust to serving agriculture in the new, broad concept of what is widely known as "agribusiness." This concept interprets agriculture as being concerned with not only the production of food and fiber and its attendant problems, machines and methods, but also the problems, machines and methods of transportation, processing, storage, handling and distribution to the consumer. Most of the leading state universities have realized the changes in agriculture and have adopted a basic philosophy toward the industry in the broader sense rather than in the narrow or production sense only. Evidence of this is the marked growth in recent years in the educational resources devoted to food science and technology, agricultural economics, etc.

### Present Activities of Agricultural Engineers

An analysis of the present activities of agricultural engineers and of their opportunities for serving agriculture under the broader concept is most interesting.

As nearly as can be determined from ASAE records, employment of Agricultural engineers is distributed about as follows:

1 Only a few graduate agricultural engineers actually go back to the farm, either as owners or as technicians on large farms. This group, it is believed, will tend to become larger in the years ahead as the scope of operations on individual farms becomes larger.

2 About 58 percent of graduate agricultural engineers are employed in the agricultural equipment industry (design, 34

percent; sales, 19 percent; research, 2 percent; self-employed, 3 percent).

3 About 42 percent are employed in public service (4 percent teaching, 19 percent research, 10 percent combination teaching and research, and 9 percent in advisory service either for the general public or the government).

4 A growing number of agricultural engineers are employed in the overseas programs of the nation or of individual companies or universities. This area also may expand rapidly in the future as world conditions become more stable.

5 A small, but highly important number of agricultural-engineering graduates are employed in the processing industries, such as milk plants, food and fiber-processing plants, and food-equipment plants, etc.

### Opportunity Outlook for Agricultural Engineers

Agriculture, considered in the broad picture, is approximately a 90 billion dollar a year business. At present agricultural engineers are really not serving much more than the 30 billion dollar a year business which is confined to the production of agricultural crops. There is great opportunity for the agricultural engineer in the 60 billion dollar a year area, which includes processing, transportation and handling. Agricultural engineers who combine basic engineering training with practical experience are ideally suited to handle many of the key positions in this latter area. It means, however, that some agricultural engineers of the future must have an opportunity for different types of training. They will need to combine basic engineering philosophy and training with an appreciation of the importance of biological and bacteriological aspects of agricultural products which will enable them to make worthwhile contributions in this area.

### New Fields for Agricultural Engineers

For the processing of agricultural products, there are approximately 50,000 processing plants in United States. Each of  
(Continued on page 556)



Fig. 1 (Left) Rotary topping attachment mounted on the high-clearance machine used in the 1958 and 1959 corn topping experiment  
 • Fig. 2 (Right) Topping attachment set to cut stalk just above the highest ear in the row (1958-59)

# Corn Topping Prior to Harvest

T. W. Casselman, J. L. Schmidt and W. G. Lovely

Assoc. Member ASAE

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**F**ARM managers, equipment manufacturers, as well as farmers, have recently shown considerable interest in the practice of topping corn prior to harvest. This interest has given rise to a number of questions. Does corn topping hasten rate of field drying and increase harvesting efficiencies by reducing lodging and the amount of stalk material going through the machine? Does it reduce yields or affect the quality of the corn? If it is effective, when should the topping operation be performed?

Investigations have shown that removal of part of the plant does affect yields. Grogan (1)\* in summarizing some results on effects of detasseling and removal of some of the leaves states that on certain occasions detasseling before pollination resulted in large yield increases. These increases occurred when "unfavorable environmental conditions" such as drought, low soil fertility, or above optimum plant populations existed. Removal of more than the tassel usually resulted in yield reductions. Kiesselback (2) reported a slight loss from removing the tassel only, a 3.5 percent loss when one leaf was removed with the tassel, a 5.9 percent loss from removing two leaves, and a loss of 13.6 percent when three leaves were removed with the tassel. Willard (3) suggests expected yield reductions and only little increase in rate of field drying from topping.

Presented as Paper No. 60-640 at the Winter Meeting of the American Society of Agricultural Engineers at Memphis, Tenn., December, 1960, on a program arranged by the Power and Machinery Division. Approved as Journal Paper No. J-3930 of the Iowa Agricultural and Home Economics Experiment Station, Ames, Iowa, Project No. 1331.

The authors—T. W. CASSELMAN, J. L. SCHMIDT and W. G. LOVELY—are, respectively assistant agricultural engineer, Everglades Branch, Florida Agricultural Experiment Station, Belle Glade, Fla. (former associate in research, Iowa Agricultural and Home Economics Experiment Station, Ames); and analytical statistician, Harvesting and Farm Processing Research Branch, and agricultural engineer, Crop Production Engineering Research Branch, (AERD, ARS), USDA, Ames, Iowa.

\*Numbers in parentheses refer to the appended references.

In 1958 and 1959 agricultural engineers of Iowa State University and the U.S. Department of Agriculture ran a series of experiments on the effects of mechanical corn topping on rate of field drying, yield, shelling percentage, test weight and machine performance. All experiments were conducted on the Agricultural Engineering Research Farm at Ames, Iowa.

## PROCEDURE

The experiments for both years were divided into two parts: the "field drying experiment" in which the effect of topping at various stages of growth on field-drying rate was studied, and the "harvesting and lodging experiment" in which the effect of topping on machine performance and stalk lodging was studied. In 1958 different plots were used for each experiment. The corn variety in the field-drying experiment was Iowa 4570; for the harvesting and lodging experiment, Iowa C-92 was used. Both seedings were made in early May.

In the 1959 study, both parts of the experiment were combined on the same plots. Iowa 4570 seed corn was planted on two different dates, May 1 and June 10. These two extremes in planting dates were used to compare the effects of topping on field corn maturing both early and late in the season.

The corn was treated (topped) at several different stages of growth. These were: (a) approximately ten days after pollination, (b) when the kernel moisture content was about 70 percent (in roasting ear stage), (c) when the kernel moisture content was about 50 percent (in dented stage), (d) when the kernel moisture content was about 38 percent (in final maturing stage), and (e) untopped check treatment.

All moisture contents were on a wet basis determined by oven drying field samples.

The topping attachment used in the two years' study was of the rotary type mounted on a high-clearance machine (Fig. 1). The height of the topper was adjusted to cut the

**Picking machine operators report improved comfort and visibility in harvesting topped corn, but tests, conducted during two years in Iowa, reveal that corn topping offers little or no additional benefits in field drying or harvesting of corn**

stalk just above the highest ear in the row. This amounted to cutting off the tassel and top four or five leaves of the stalk (Fig. 2).

Randomized block and split-plot designs were used in these experiments. Moisture samples were taken three times a week on corn just topped. Two weeks after topping, samples were taken once a week. Untopped (check) corn was sampled three times a week throughout the season. Every sample taken during the season was processed to obtain the kernel moisture; frequently the ears were completely shelled to obtain information on shelling percentage and test weight. Complete experimental outlines are given in the references (4) and (5).

At harvest time total stalks and lodged stalks were counted. Immediately before harvesting, all loose ears were hand-gathered to determine preharvest losses. A combine, a mounted picker-sheller, and a mounted picker were used and all were equipped with two-row picker heads.

To obtain estimates of shelled corn losses, plastic sheeting was laid down at random positions along the rows prior to harvesting. The shelled corn on the sheets and all missed ears were hand-gathered after the corn was picked. These two items were used to estimate corn losses at the snapping rolls. In addition, all trash and cobs from the combine and picker-sheller were caught to determine separating losses.

The corn gathered by each machine was weighed and designated as machine yield. Total yield was determined by adding machine yield, preharvest losses, snapping roll losses and separating losses.

## RESULTS

### Kernel Moisture Content

Fig. 3 shows the kernel moisture content for early and late planted 1959 corn and 1958 corn as a function of sampling date. The solid lines show the trend changes in moisture content of the 1959 untopped corn. The 1958 kernel-drying data for untopped corn are represented by the dotted line.

The drying trend for 1958 is quite different from that of 1959. This was due to different weather conditions for the two years toward the end of the drying period. In 1958 there was practically no precipitation during the last week of September and the entire month of October. In 1959, however, rainfall during these two months was greater than normal. During the last two weeks of September and the

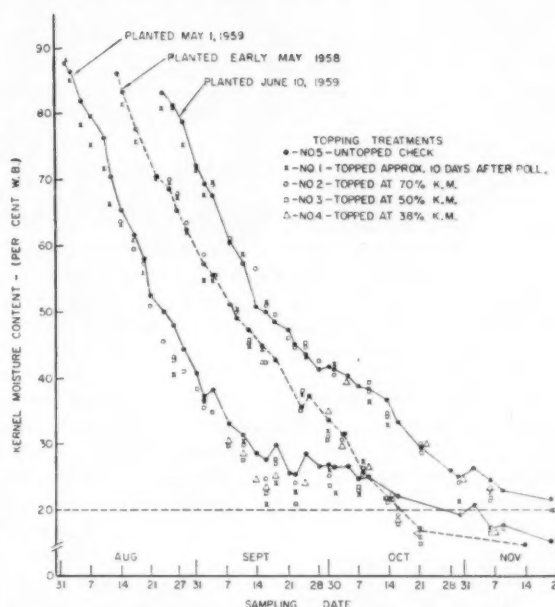


Fig. 3 Variation of kernel moisture content with date

first two weeks of October in 1959, the relative humidity was high and it rained nearly every day. This unusually extended period of continuous wet weather explains the reason for slower drying of the early planted 1959 corn below 30 percent kernel moisture and the late planted 1959 corn at higher moistures. In good drying weather, such as occurred in 1958, corn continues to dry at a rather rapid rate to a moisture content of 20 percent or even lower.

In the early planted 1959 corn the kernel moisture content of the corn topped 10 days after pollination was lower than the kernel moisture of the untopped corn. This difference was significant at the 5 percent level. No significant differences were found between any of the other topping treatments and the untopped corn although there was a trend toward lower kernel moisture contents for the topped corn.

Contrary to the results found in the early planted corn, kernel moisture contents of topped and untopped late-planted 1959 corn were not significantly different for any of the treatments. Even the presence of the trend toward lower

TABLE 1. EFFECT OF TOPPING ON YIELD AND STALK BREAKAGE, IOWA STATE UNIVERSITY, 1958-1959

Topping treatment	Total yield*			Stalk breakage†		
	Planting dates			Planting dates		
	Early May 1958	May 1, 1959	June 10, 1959	Early May 1958	May 1, 1959	June 10, 1959
1 Ten days after pollination	99.8	109.8	68.9	10.5	8.6	7.3
2 Kernel moisture 70 percent‡	105.6	107.8	74.3	11.5	8.4	5.4
3 Kernel moisture 50 percent‡	107.7	118.6	80.7	10.8	8.4	4.8
4 Kernel moisture 38 percent‡	104.6	114.4	83.6	16.3	10.2	5.7
5 Untopped check	112.4	120.9	75.6	11.6	5.7	5.5

\*Bushels per acre at 15.5 percent moisture.

†Percent of total stand.

‡Percent wet basis.

## ... Corn Topping Prior to Harvest

kernel moisture contents observed in the topped early planted corn was absent. These results for late planted corn were very similar to those obtained in the 1958 experiment for corn planted in early May.

If 20 percent kernel moisture is accepted as a suitable criterion for harvest, then according to Fig. 3 all early planted topped corn could have been harvested on about October 16, approximately 11 days before the untopped corn reached 20 percent. While this was true of the early planted corn, it was not true for the late planted corn.

The 1959 studies indicated that there may be certain conditions where topping could change the harvest date by several days. However, this may be at the expense of a reduction in yield due to early topping as indicated by Table 1 where corn topped 10 days after pollination yielded approximately 11 bushels per acre less than untopped corn.

### Shelling Percentage

Shelling percentages (the ratio of wet kernel weight to wet ear weight times 100) of corn from both years of study showed no significant differences between topped and untopped corn regardless of date of planting. However, there was a slight trend toward lower shelling percentages in topped corn.

### Test Weight

Topping had no effect on test weights (pounds per bushel) in 1958 or 1959 regardless of planting date. As in shelling percentages, a slight trend toward lower test weights was observed in topped corn.

## Total Yields

The yields (bushels per acre) for both years are given in Table 1. Topping had no significant effect on total yields. However, there was a slight trend toward lower yields associated with topping, especially in the corn topped 10 days after pollination.

It is interesting to note that in both years' studies the lowest yields occurred in the corn which was topped ten days after pollination. These observations point out that extremely early topping tended to reduce total yields. This was probably due to excessive plant injury as a result of early topping.

### Stand Count

As expected, topping had no effect on the number of stalks per acre for either of the two years.

### Lodging

A stalk was considered down or lodged if it was bent over to such an extent as to allow the ear to touch the ground. Differences of down stalks between treatments were so small as to be not significant. The percent lodged stalks is also tabulated in Table 1.

### Preharvest Losses

Preharvest losses were not significantly different between topped and untopped corn for either year, planting date, or before and after a wind storm (Table 2).

### Machine Losses

A summary of the effects of topping on machine performance is given in Table 2. Topping had no effect on machine losses as measured by ear and shelled corn losses

TABLE 2. SUMMARY OF THE EFFECTS OF CORN TOPPING ON HARVESTING MACHINE PERFORMANCE, IOWA STATE UNIVERSITY

	1958				1959			
	Before windstorm		After windstorm		Planted May 1		Planted June 10	
	Topped 35% K.M.	Untopped	Topped 35% K.M.	Untopped	Topped 38% K.M.	Untopped	Topped 38% K.M.	Untopped
Lodging (percent down stalks)*	13.9	10.7	81.9	70.1	10.2	5.7	5.7	5.5
Total yield†	125	135	133	121	114	121	84	76
Loss from missed ears‡								
Picker	9.1	5.8	36.0	31.4	8.5	3.2	4.7	5.6
Picker-sheller	6.9	5.0	18.7	20.6	6.4	2.6	5.9	4.2
Combine	5.7	3.9	20.9	14.7	3.9	2.0	2.8	3.6
Average	7.2	4.9	25.2	22.2	6.3	2.6	4.5	4.5
Shelled corn loss at rolls‡								
Picker	4.4	5.8	8.5	6.4	9.4	10.2	8.8	7.0
Picker-sheller	3.5	2.5	7.9	5.8	5.1	5.8	6.4	5.1
Combine	2.8	3.4	6.8	4.7	3.2	1.3	1.1	1.2
Average	3.6	3.9	7.7	5.6	5.9	5.8	5.4	4.4
Shelled corn loss in trash‡								
Picker	—	—	—	—	—	—	—	—
Picker-sheller	0.7	0.8	0.3	0.3	0.1	0.0	0.0	0.0
Combine	0.4	0.7	0.2	0.2	1.2	1.3	1.5	1.3
Average	0.6	0.8	0.2	0.2	0.4	0.4	0.5	0.4
Total harvesting loss‡								
Picker	13.5	11.6	44.5	37.7	17.9	13.5	13.5	12.6
Picker-sheller	11.1	8.4	27.1	26.8	11.5	8.4	12.4	9.4
Combine	8.9	8.0	27.9	19.5	4.3	4.6	5.0	6.1
Average	11.2	9.3	33.2	28.0	11.3	8.8	10.3	9.3

\*Percent of total stand.

†Bushels per acre at 15.5 percent moisture.

‡Percent of total yield.

at the snapping rolls and shelled corn in the trash. This was true of both planting dates in 1959 as well as in the 1958 study. Topping had little or no effect on harvesting losses for the picker, picker-sheller, or the combine. These studies were not designed to evaluate different types of harvesters in terms of harvesting losses but to study the effect of topping on machine losses. Comparing the losses that occurred with the different machines is valid only for the three machines used and not for harvesting machines in general.

#### FIELD SCALE OBSERVATIONS

As part of the 1959 topping studies three fields of corn of about 20 acres each were topped for a full-scale study of the effects of corn topping on harvesting under field conditions.

In these fields the corn was topped at approximately 35 percent kernel moisture content. Every other set of four rows was topped across the field; hence, the harvesting machine operated alternately in topped and untopped corn. This study permitted some general qualitative rather than quantitative observations on machine performance as well as operator comfort, visibility and reactions as effected by corn topping.

Observations of machine performance were limited to counting the number of times the picker heads plugged and the snapping roll clutches slipped during runs the length of the field. These counts were made at several different speeds of operation. In general these observations show that it may be possible to harvest faster with less clutch slippage or plugging in topped corn than in untopped corn.

The operator preferred working in topped corn. The main advantages claimed were (a) better visibility of the rows allowing him to guide the gathering heads more accurately and (b) less dust and chaff blowing around the seat due to the absence of whipping corn tops.

These results are, of course, of a very general nature due to the fact that intangible items such as operator comfort, visibility, and the like are difficult to measure quantitatively.

#### SUMMARY

Results of corn topping experiments conducted in Iowa in 1958 and 1959 show that topping had little or no effect on the rate of field drying regardless of the topping date. The only exception was in the 1959 early planted corn where the rate of decline of kernel moisture content of the corn topped ten days after pollination was significantly faster than the rate of decline of the untopped corn. Differences in test weights and shelling percentages between topped and untopped corn were not significant; however the weights and percentages averaged slightly lower in the topped corn. Though total yields were not significantly different, there was a tendency toward lower yields in the topped corn, especially in corn topped very early in the season (i.e., 10 days after pollination).

Stands, lodging preharvest losses, machine losses and machine yields did not show any significant differences due to topping.

Observations of field-scale operations indicate topping improves the comfort and visibility of the picking machine operator.

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## Agricultural Engineering Exposition Opens Day Before Winter Meeting

**S**HEA Expositions Corp. (Exposition managers) have suggested that the following information might be helpful to those who plan to attend both the technical sessions and the Agricultural Engineering Exposition during the ASAE Winter Meeting at the Palmer House Hotel, Chicago, December 12 to 15. In making hotel reservations, it is suggested that consideration should be given to the fact that the Agricultural Engineering Exposition opens its doors in the Palmer House on Tuesday, December 12, one day preceding the technical sessions. The first five concurrent technical sessions will begin at 8:00 a.m. on Wednesday morning, December 13.

Early arrivals on Tuesday morning will have plenty of time to register at the hotel, have lunch, and then visit the displays and demonstrations exhibited by a most representative group of American manufacturers—starting at 2:00 p.m. Tuesday afternoon arrivals have until 9:00 p.m. to visit the exhibit area.

The exhibit hall will open each day, Tuesday through Thursday, December 12 to 14, at 2:00 p.m. and will close at 9:00 p.m. ASAE members are urged to invite interested associates and fellow workers to visit the first ASAE-endorsed Agricultural Engineering Exposition and to attend the Winter Meeting technical sessions.

The November issue of *AGRICULTURAL ENGINEERING* will contain a complete report on the Winter Meeting and will include a floor plan of the exhibit hall and a description of each exhibit. Extra copies will be available for distribution at the Exposition. The issue will also provide advertisers with an opportunity to carry tie-in messages with reference to their exhibits.

Reservations for exhibit booths may be made by writing to Shea Expositions Corp., One Gateway Center, Pittsburgh 22, Pa.

## Research Summary on Water Supplies

**A**"SUMMARY of Research on Individual Household and Farmstead Water Supplies" is available from ASAE, 420 Main St., St. Joseph, Mich., at 50 cents per copy or in exchange for one Technical Paper Order Form.

This report, prepared by the ASAE Water Treatment and Use Committee, is a summary of the results of a questionnaire sent to agricultural engineering and sanitary engineering departments, as well as persons dealing with research in the area of individual household and farmstead water supplies. Replies were received from 42 states and 3 Canadian provinces.

# Rate, Duration, and Frequency of Tile Flow

*Drain tile flows for various depths and spacings and under various crop covers were recorded over an eight-year period*

G. O. Schwab, J. L. Fouss and A. P. Leech

Member ASAE Assoc. Member ASAE

**T**O predict the design hydraulic capacity and the drainage effect of tile drains at various depths and spacings, long-time flow measurements are needed. An experiment was installed for this purpose in 1949 at the Tiffin State Hospital Farm at Tiffin, Ohio. The primary objective of this experiment was to determine the rate and duration of tile flow for various crops, drain depths, and spacings. This paper is a progress report for the eight-year period, 1951-58.

## REVIEW OF LITERATURE

Very few long-term records of tile flow have been made in humid areas of the United States. Present recommendations for drainage coefficients (depth of water to be removed in 24 hr) are based primarily on experience and judgment. Schlick (8)\* measured the tile flow from six drainage systems ranging in area from 10.8 to 443 acres during the period 1908-16, inclusive. These data show that the closer the spacing of the lateral drains, the greater the rate of outflow. In average Iowa soils where the laterals were 4 ft deep and 100 ft apart he recommended that the drainage coefficient should be at least  $\frac{1}{16}$  or  $\frac{1}{8}$  in. per day. Should spacing be reduced to 50 ft, this rate should probably be increased to  $\frac{1}{2}$  in. or more. In North Carolina, Lynde (4) measured tile flow for three years from a 23 and a 52-acre system. He recommended a drainage coefficient of  $\frac{1}{4}$  in. for that area. For drains closer than 100 ft, a rate of  $\frac{3}{8}$  in. per day was suggested. In foreign countries considerably more tile flow data have been gathered. Luthin (3, p. 498) refers to several such reports as well as results of the effect of water table on crop growth. The discharge measurements of Rothe and Philipp (7) show that shallower depth tile resulted in higher maximum discharge rates, but the discharge declined at a more rapid rate.

Goins (1) prepared a report on this experiment for the years 1950-54. Hydrographs of outflow were given for low and high-intensity storms. Because of this shorter

period of record, some of the data are not entirely consistent with the results in this report. Goins and Taylor (2) compared the water-table height and rate of outflow for meadow and the oats crops on some of the fields in 1956 and 1957. These data show the shape of the water table during draw-down for the various depths and spacings of tile as well as the relationship between tile flow and height of water table. At the higher flow rates, the flow varied nearly linearly with the midpoint water table height above the drains.

## EXPERIMENTAL SITE AND LAYOUT

The installation was located on a lakebed soil at Tiffin, Ohio. The layout consisted of six fields each of which included tile depths of 2 and 3 ft and tile spacings of 30 and 60 ft in all combinations. The tile lines vary in length from 400 to 800 ft. Two crop rotations were followed, namely, a CO rotation and COMM rotation (C, corn; O, small grain; M, meadow, alfalfa mixture). A given field was planted entirely to one crop so that each crop in the two rotations was grown each year. Because of space limitations, the treatments were not replicated in a given year. The four combinations of depth and spacing in each of the six fields made a total of 24 tile flow measuring stations. The flow was measured with a 30-deg V weir and was recorded with an FW-1 water-level recorder. Rainfall was measured with a recording gage at the site.

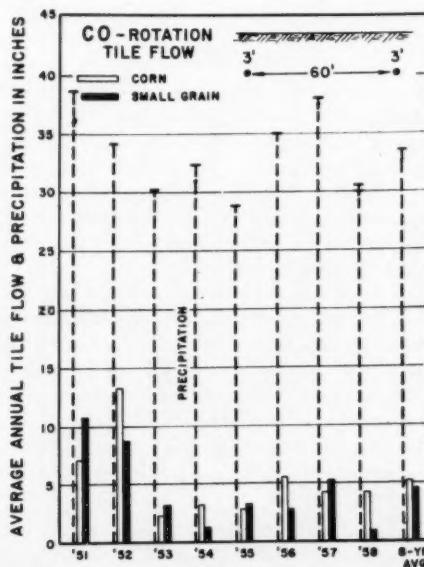


Fig. 1 Annual distribution of precipitation and tile flow for 1951-58

Presented as Paper No. 60-716 at the Winter Meeting of the American Society of Agricultural Engineers at Memphis, Tenn., December, 1960, on a program arranged by the Soil and Water Division. Approved for publication as Journal Article No. 89-60 of the Ohio Agricultural Experiment Station (Project, Hatch 64).

The authors — G. O. SCHWAB, J. L. FOUSS, and A. P. LEECH — are, respectively, professor of agricultural engineering, Ohio Agricultural Experiment Station; agricultural engineer, Soil and Water Conservation Research Division, (ARS), USDA, and technician, Ohio Agricultural Experiment Station.

**Acknowledgment:** The authors acknowledge the contributions of R. E. Yoder, C. R. Weaver, Truman Goins and many others who helped in collecting and analyzing the records. The experiment was conducted in cooperation with the Ohio Department of Mental Hygiene and Correction, Tiffin State Hospital Farm.

\*Numbers in parentheses refer to the appended references.

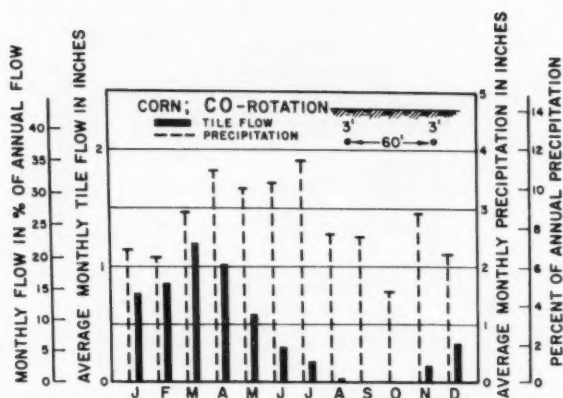


Fig. 2 Average monthly distribution of tile flow and precipitation

The soil was classified as Nappanee silt loam, having a topsoil depth of 8 to 12 in. As reported by Goins and Taylor (2), the average hydraulic conductivity in one of the six fields was 0.88 iph. Additional description of the soils and the layout can be found in Goins (1) and Goins and Taylor (2).

With one exception, in field six in 1952, wheat was grown rather than oats in the rotations during the first three years, 1951-53. Corn prior to wheat was harvested for silage in September. Average planting date for corn was May 15, for wheat October 1, and for oats March 15.

#### PROCESSING OF DATA

Tile flow and corresponding information were tabulated on IBM cards for processing. A card was prepared for each calendar day that flow occurred, provided the flow was 0.005 in. or greater. The average error resulting from the omission of these small flows was not more than about 2 percent. Continuous records were maintained for the entire year. The following information was placed on punch cards:

- 1 Soil and site identification
- 2 Slope of land surface
- 3 Tile depth and spacing
- 4 Tile length
- 5 Crop rotation, type of crop, and crop condition
- 6 Date of flow
- 7 Total daily flow
- 8 Daily flow for the previous day (only when peak flow was 0.125 in. or greater)
- 9 Maximum peak flow during the day
- 10 Duration of flow at rates of  $\frac{1}{8}$ ,  $\frac{1}{4}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $1\frac{1}{4}$ , 2, and 4 in.
- 11 Daily rainfall
- 12 Rainfall intensity duration of 30 min and 2 hr
- 13 Previous day's rainfall (only when peak flow was recorded)
- 14 Air temperature
- 15 Soil temperature at nearest Weather Bureau location.

#### RESULTS

The data in this report include the tile flow for the eight-year period, 1951-58. During these years four com-

plete cycles of the two-year rotation and two cycles of the four-year rotation occurred. Total tile flow during the four-month period, March through June, and during the calendar year for all crops and all combinations of tile depths and spacings was determined. The tile flow for corn in the two-year rotation for a tile spacing of 60 ft, and for a depth of 3 ft was selected to illustrate the distribution and frequency of flow. Corn was selected since it gives a marked response to drainage and this depth and spacing was recommended in the Ohio Drainage Guide (6). Direct comparisons of the data for the two and the four-year rotations can not be made because the crops were grown in different fields. The fields were adjacent to one another, but the tile flow suggest considerable difference in soil permeability.

#### Distribution of Precipitation and Tile Flow

The annual distribution of precipitation and tile flow (CO rotation, 3-ft depth, and 60-ft spacing only) for the eight years of record are shown in Fig. 1. The tile flow for both corn and small grain is shown. The 25-year (1921-46) average annual precipitation at Tiffin, Ohio, was 2.3 in. higher than the eight-year average at the farm. However, the variation in precipitation during the eight years was not more than 15 percent.

The percentage variation in tile flow from year to year was greater than the variation in precipitation. Because of soil differences in the two fields in the CO rotation, the tile flow for small grain was greater than the flow for corn in the odd-numbered years. During the even-numbered years, the tile flow for corn was greater than for small grain. Since one-half of the even-numbered years and one-half the odd-numbered years were above and below normal, the average flow will tend to balance out soil differences.

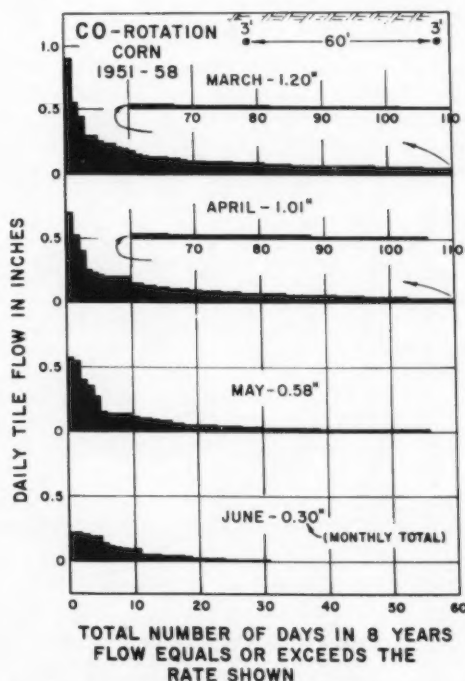


Fig. 3 Frequency distribution of daily flows for March, April, May, and June

### ... Rate of Tile Flow

The average monthly distribution of precipitation and tile flow for the eight-year period is given in Fig. 2. From the standpoint of crop production the four-month period from March through June was assumed to be the most critical period. March is about the earliest month for tillage operations. Corn is not planted until about May 15, and the plants use little moisture and do not protect the soil from splash erosion for at least another month. Although the tile flow for June is low, the high monthly rainfall shows a potential for possible crop damage. July was not included because evapotranspiration was high and crop damage due to poor drainage was generally not serious. Although considerable moisture falls in the winter months, these months were excluded because the flow did not have a direct effect on crop production. Tile flow for the months of August, September, and October was essentially zero.

### Frequency Distribution of Tile Flow

A typical frequency distribution of daily tile flow for the months of March, April, May, and June is shown in Fig. 3. The daily flows in decreasing order of magnitude were recorded in March, April, May and June. The instantaneous peak flow during any day was always higher than the average daily flow. The total monthly flow and the number of days with flow greater than 0.01 in. decrease in the same order as the daily flow, i.e., from March through June. Although the average rainfall for April was higher than in March, the tile flow was slightly less in April due to greater evapotranspiration. The number of days during the eight-year period that the tile flowed at rates greater than  $\frac{3}{8}$  in. was March three days, April three days, May three days, and June zero. The average number of days annually during the four-month period was 1.1.

In Fig. 4 data similar to that in Fig. 3 are shown for the four-month period, March through June. The total

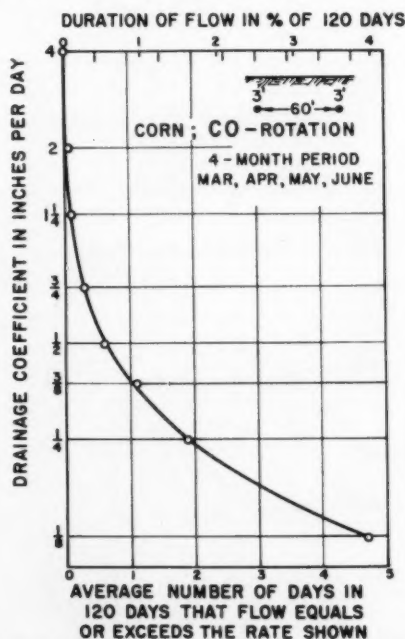


Fig. 4 Summation of the duration of flows at rates  $\frac{1}{8}$ -in. per day or more

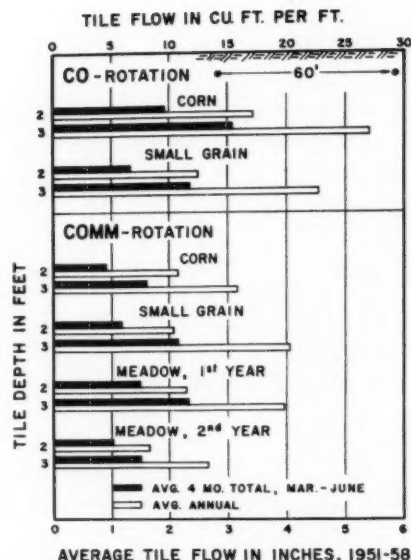


Fig. 5 Effect of tile depth on flow for a 60-ft spacing

time that tile flow occurred at  $\frac{1}{8}$  in. per day or more was obtained by tabulating the number of hours that the flow rate was equalled or exceeded during a flow period without regard to the calendar day. The data do not represent calendar days of flow as in Fig. 3. Since the duration of flow in Fig. 4 was obtained from a hydrograph, it is more accurate than the data in Fig. 3. For a drainage rate of  $\frac{3}{8}$  in. per day the curve in Fig. 4 gives 1.1 days or the same as Fig. 3. These values will not necessarily be the same.

In Fig. 4 the  $\frac{3}{8}$ -in. coefficient occurs where the slope of the curve is fairly steep. If the drainage rate of  $\frac{3}{8}$  in. were increased to  $\frac{1}{2}$  in., the reduction in duration of flow would be 0.5 day; whereas, if the coefficient were reduced to  $\frac{1}{4}$ , an increase of 0.8 day would occur. These data indicate that the design coefficient of  $\frac{3}{8}$  in. for this area is on a desirable portion of the curve.

### Tile Depth

The effect of depth on average tile flow for a 60-ft spacing is given in Fig. 5. Comparisons made for the 30-ft spacing were similar. The four-month and the annual tile flow were greater for the 3-ft depth than the 2-ft depth. The highest flow for the four-month period was for the corn crop in the two-year rotation at both depths. The flow for corn and the second-year meadow in the four-year rotation was about the same, but the lowest for any of the crops. These low flows were probably caused by the high moisture use of the meadow crop and by the carry-over effect to the following corn year. The annual tile flow shows a trend similar to that for the four-month flow.

In terms of drainage effect the tile flow measured in inches of runoff for the area drained is more important than the actual flow from the tile. However, in terms of tile capacity the quantity of flow per unit length is important. The tile flow in cubic feet per linear foot of drain is shown by the scale at the top of Fig. 5. In comparing the flow for the two spacings, the units of measurement must be considered since the 60 ft spacing drains twice the area of the 30 ft. spacing.

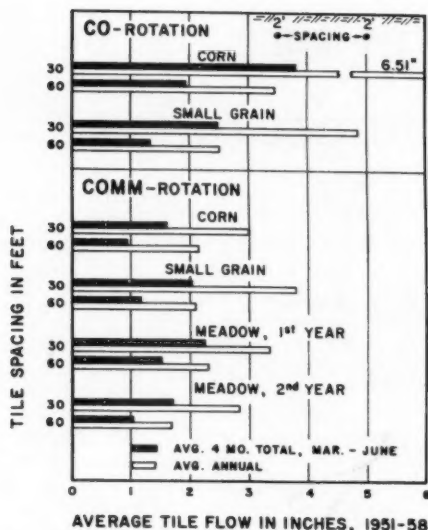


Fig. 6 Effect of spacing on tile flow for a 2-ft depth

### Tile Spacing

The effect of tile spacing on flow is shown in Fig. 6 for a 2-ft tile depth. Comparisons were similar for the 3-ft depth. The 30-ft spacing gave a higher flow than the 60-ft spacing in terms of inches of water removed. When the comparison was made of the tile flow in cubic feet per linear foot of drain, the 60-ft spacing gave about 40 percent greater flow than the 30-ft spacing. However, this increase in flow must be equivalent to 100 percent to provide the same drainage coefficient for both spacings. In general, the difference in flow for the four-month period between the 30 and 60-ft spacings was greater for the tile at a 2-ft depth, as shown in Fig. 6, than for tile at a 3-ft depth. The same general relationships apply for the annual flow as for the four-month total described above.

### DISCUSSION

In the data presented here the emphasis has been placed on the tile flow for the four-month period March through June and on annual flow. Although daily flow rates are more important in designing the drainage system than volume of flow, these rates were not consistent for the various depths and spacing combinations. For example, the flow duration curves (Fig. 4) were not consistent for different depth and spacing combinations, crops, and rotations. This inconsistency probably resulted from the lack of replication and from variability in the hydraulic conductivity of the soil in the different fields. The volume of flow for the four-month period or for the calendar year probably reflects the effects of crops and soil porosity to a greater extent than the hydraulic conductivity of the soil. In 1960 the cropping system in the experiment was changed so that all fields were in the same crop. After several years of data, these differences in daily flow rates can be evaluated. However, the results to date do not indicate any justification for changing the present design drainage rate of  $\frac{3}{8}$  in. per 24 hr for this area.

Much of the data that has been tabulated on punch cards has not been given in this report. Such effects as antecedent moisture, soil and air temperature, condition of the crop

at the time of flow, and other factors have been recorded for possible evaluation. Peak flow rates were recorded as high as 9.4 in. per day, but these are generally not of interest from the standpoint of design.

Some of the data were plotted for the purpose of making a hydrologic-frequency analysis study. On the basis of a procedure presented by Mockus (5) the eight-year period of record was inadequate for predicting long-time trends of peak flows, daily flow rates, and flow volumes.

### SUMMARY AND CONCLUSIONS

Eight years of tile flow records at Tiffin, Ohio, were evaluated for drains at 2 and 3-ft depths and at spacings of 30 and 60 ft in all combinations. Only part of the data is given in this report. The four-month total flow for March through June and the annual flow were compared for all crops in a two-year rotation and in a four-year rotation. The crops included corn, small grain, and first and second year meadow. The following are the principal conclusions:

1 Annual tile flow varied considerably from year to year, and the percentage variation was much greater than annual precipitation.

2 The highest monthly flow for the year occurred in March, followed by April. During the winter months the flow was quite high, but these months were not considered as important in terms of crop production as the four-month period March through June. Practically no flow occurred during the months of August, September, and October.

3 In general, the highest peak flow, the greatest volume of flow, and the total number of days of flow greater than 0.01 in. occurred in March and decreased in order for the months of April, May, and June.

4 For corn in the two-year rotation and for tile at 3-ft depth and 60-ft spacing the duration of flow at  $\frac{3}{8}$  in. per 24 hr or greater was only 1.1 days, or about 1 percent of the time, during the four-month period March through June.

5 Corn in the two-year rotation with tile at 3-ft depth and 30-ft spacing produced the highest four-month total and highest annual flow of any crop or combination of drainage system. However, corn and second-year meadow in the four-year rotation gave the lowest flow primarily due to low antecedent moisture conditions.

6 The four-month total and annual flow in inches from tile at depths of 3 ft were greater than the flow from tile at 2 ft.

7 The tile flow in inches from the 30-ft spacings was considerably greater than that from the 60-ft spacings for both the four-month period, March through June, and the calendar year. However, on the basis of the actual flow per linear foot of tile, the 60-ft spacings gave about 40 percent more flow than the 30-ft spacings.

8 The duration or percentage of time for various daily flow rates during the four-month period, March through June, was not consistent among the various depth and spacing combinations. Additional data need to be obtained before daily flow rate comparisons can be made.

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(Continued on page 555)

# Graphical Determination of the Most Economical Pipe Size

Graphs provide rapid method for most economical size selection of commonly used aluminum and steel pipe for water conveyance

Jay M. Bagley and Ray K. Linsley

Member ASAE

**A** NECESSARY part of the design of water conveyance works for any purpose is the selection of sizes, materials and equipment for utmost economy. The design should produce a workable facility at a minimum cost

for installation, operation and maintenance. For most irrigation systems the piping arrangement and pattern of water demand are not complex. Nevertheless, the selection of economic pipe sizes is an engineering consideration of as much importance as the correct solution of the hydraulic problems involved.

In the present analysis, the mathematical expressions developed for fixed and variable costs were added to give an equation for total annual cost. This was differentiated with respect to diameter to give an equation which could be solved for the pipe diameter resulting in the minimum total cost. The annual fixed costs were calculated as the product of the initial investment in dollars and the capital recovery factor. The capital recovery factor is in turn a function of the rate of interest and the expected life of the pipe (or the depreciation period). The variable or operational costs were principally those for power to overcome friction. These costs are functions of the rate of flow, fuel, costs, hours of operation, pump efficiency, pipe friction characteristics, etc.

Consideration has been given to expressing the initial cost variable so as to minimize the effect of future price fluctuations. Functional relations between price, diameter, weight, wall thickness, etc., were studied. For steel pipe used in irrigation systems, costs seem to vary directly with diameter for any given gage. In other words, the cost per pound was found to be essentially constant for a particular type and gage of pipe regardless of diameter. To use the accompanying graph (Fig. 1), the designer must decide on the type of pipe he will use and then calculate the ratio of cost to diameter based on current price information. Expressing the cost factor in this manner allows greater flexibility in the use of the charts for a wider variety of pipe types while maintaining its utility even though prices change. Simply picking the proper ratio regardless of what factors fix it will give the desired result.

Aluminum tubing does not show such a simple relation between cost and diameter (or weight). There are a number of reasons for this. Aluminum tubing is not manufactured in gages such that a purchaser can select various wall thicknesses in all sizes. There are classes having differ-

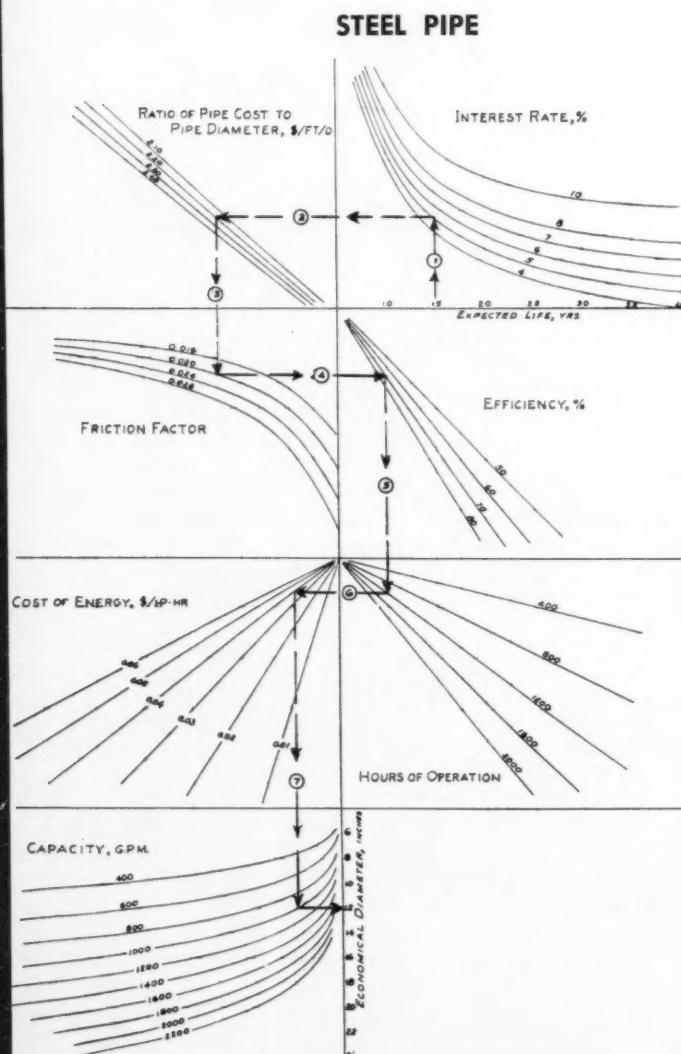


Fig. 1 Graphical selection of most economical steel pipe takes into consideration changes in design variables

Presented as Paper No. 60-730 at the Winter Meeting of the American Society of Agricultural Engineers at Memphis, Tenn., December 1960, on a program arranged by the Soil and Water Division.

The authors — JAY M. BAGLEY and RAY K. LINSLEY — are, respectively, associate professor of civil and irrigation engineering, Utah State University, and professor and executive head, civil engineering department, Stanford University.

ent minimum strength standards, but in any given class the wall thickness varies with diameter. Price per unit length may also vary considerably depending on the lengths of individual sections where couplings are included. The type of coupling may also vary, causing a variation in price per foot even though individual section lengths are the same. Another factor affecting the price relation for aluminum tubing is quantity of the various diameters and lengths marketed. For example, two-inch-diameter tubing makes up a very small percentage of the tubing sold whereas four-inch tubing accounts for nearly one-third of total sales. These and other factors combine in a rather complex way to give a curvilinear relation when costs are plotted against diameter. There is a steadily increasing increment of unit cost with each uniform increment of increased diameter.

A good fit to this curve was found by incorporating a relation between wall thickness and diameter with the relation between cost per foot and cost per pound. The resulting quadratic equation was found to be accurate within 3 percent for diameters between four and eight inches. The error increases for sizes above eight or below four inches. In using Fig. 2 the designer must determine tubing costs on a "per pound" basis. In so doing, it is advisable to use price information for diameters that are most likely to be used if converting from per foot costs.

The Darcy friction factor was used in the analysis because the derived expressions were simplified by its use. Calculation of  $f$  from other friction factors can be made from the following relations:

$$f = 258/C^2 = 180n^2/D^{1/3} = K/15.5(DV)^{0.1}$$

where  $C$  is the coefficient of the Chezy formula,  $n$  is the resistance coefficient for the Manning equation, and  $K$  is the coefficient for the Scobey formula. Lee has prepared a nomograph relating these factors to each other.\* Although one needs diameter and velocity to find  $f$  from a given value of the Scobey friction factor,  $K$ , the value of  $(DV)^{0.1}$  can be taken as unity to obtain an initial value of  $f$ . Using this value of  $f$ , the economical diameter can be found from the graphs. The value of  $D$  thus obtained can be used to recalculate  $(DV)^{0.1}$  and hence a better value of  $f$ . In the range of velocities normally encountered, assuming a value of unity for this expression will be within 15 percent of the true value. Therefore, the second determination of  $f$  should be sufficiently accurate. Reference should be made to recognized texts, handbooks, or literature for selection of friction factors for specific situations†.

There are seven variables included in the graphical charts. Other variables such as costs for trenching, labor, welding, engineering, insurance, pumping plant, etc., will have some effect on selection of economic pipe size. However, unless these items are abnormally costly, they will not have much influence. (This is not to infer that their neglect would have no effect on the workability of the design.) Costs of some of the above items are essentially independent of the pipe line so that they can be safely ignored. Capital costs of pumping plant and equipment are not affected by

the quantity pumped or the pumping head within the ranges commonly applicable. Likewise, operation costs exclusive of power costs are relatively stable and are little affected by quantity and head conditions. The validity of such statements can be realized by considering the function with which we are dealing. The plot of cost vs. diameter results in a U-shaped curve which is quite flat in the vicinity of the most economic diameter. Since the functional relation indicates that the factors (with the exception of discharge) vary generally as the one-sixth power of the diameter, it is plain that it would take a fairly large error in any variable to produce a significant error in economic pipe selection. Those items that are ignored should certainly be considered on their individual merits as dictated by judgment, but would not ordinarily fluctuate sufficiently to cause much change in computed economic pipe size. Since the final selection must be based on standard pipe diameters the effect of the neglected factors appears even less important.

(Continued on page 555)

## ALUMINUM PIPE

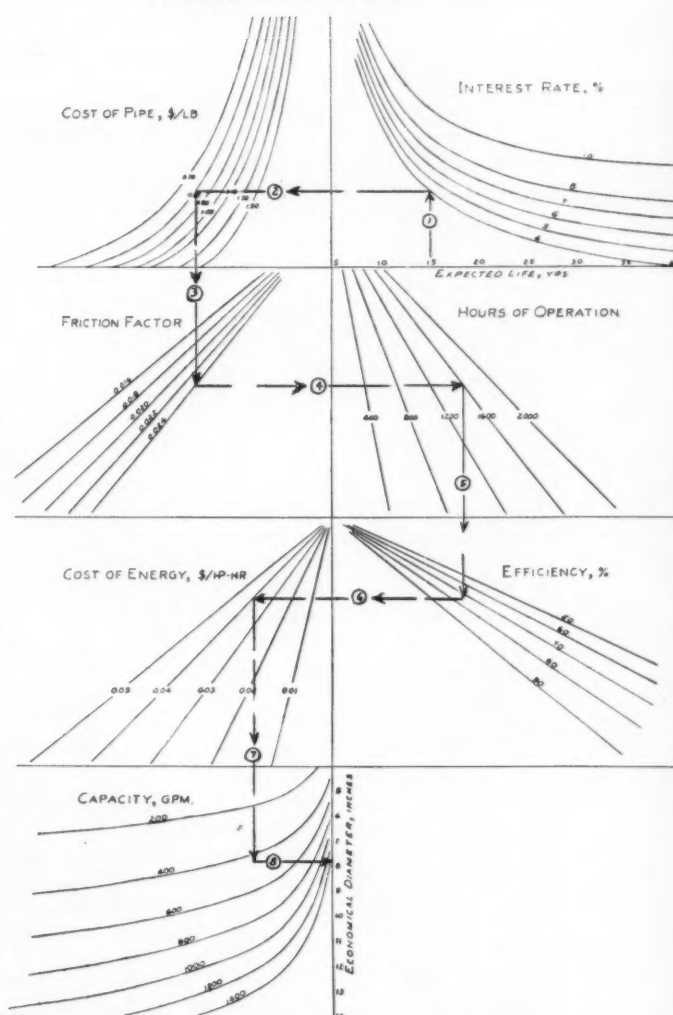


Fig. 2 Graphical selection of most economical aluminum pipe takes into consideration changes in design variables

\*Lee, F. S. Y., "Pipe flow formulas compared by nomograph," *Civil Engineering*, November 1959.

†See, for instance, "Sprinkler Irrigation," Darby Printing Co., 1959.

# A Low-Cost, Strain-Gage, Engine-Cylinder Pressure Transducer

Vernon D. Pepper and Gerald C. Zoerb

Assoc. Member ASAE

Member ASAE

**A**N engine-cylinder pressure transducer is an extremely useful device for research study or laboratory demonstration of internal-combustion engine theory and operation. The effects of engine design and operating variables on engine performance can be illustrated effectively by use of pressure-volume or pressure-time diagrams. A pressure-time diagram is often more useful than a pressure-volume diagram for studying effects of fuel-air ratio, ignition timing, compression ratio, and combustion-chamber shape, on the magnitude and uniformity of pressure rise in the engine cylinder. It can also show the peak pressure in relation to crankshaft angle.

The usual means for obtaining a pressure curve is to feed a voltage, proportional to engine-cylinder pressure, into the vertical sweep of a cathode-ray oscilloscope. Several methods may be used to obtain an electrical output proportional to engine-cylinder pressure. One method is by means of a piezoelectric pickup which contains a quartz crystal that produces an electromotive force (emf) proportional to the pressure on the crystal. Another method is with a pressure-sensitive diaphragm that moves a connected arm and thus changes the capacitance in an electrical circuit.

Many of the commercial pressure pickups require tapping an additional hole in the cylinder head which may

result in alteration of heat-dissipation patterns and possibly in significant increases in the combustion-chamber volume. These units may also require auxiliary water cooling, which further reduces their simplicity and desirability. For laboratory demonstration purposes, however, the above characteristics are not objectionable since relative changes in the pressure-time diagram are more important than absolute values. The high cost of commercial high-temperature pressure pickups is prohibitive for many university budgets. It was for this reason that an inexpensive transducer unit for indicating and/or recording engine-cylinder pressure-time diagrams, was designed and built by the agricultural engineering department at South Dakota State College.

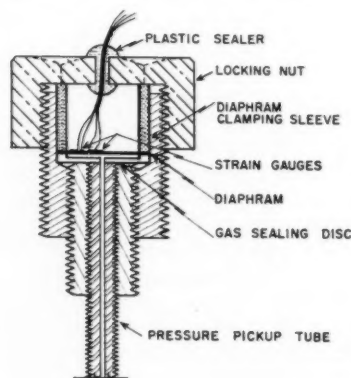


Fig. 2 Cross section of pressure transducer

*An Instrument News Contribution.* Articles on agricultural applications of instruments and controls and related problems are invited by the ASAE Committee on Instrumentation and Controls, and should be submitted direct to Karl H. Norris, instrument news editor, 105A South Wing, Administration Bldg., Plant Industry Station, Beltsville, Md.

The authors — VERNON D. PEPPER and GERALD C. ZOERB — are, respectively, test engineer, International Harvester Co., Hinsdale, Ill., and associate professor of agricultural engineering, University of Saskatchewan, Saskatoon, Canada.

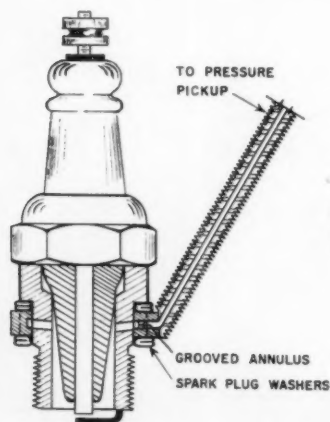
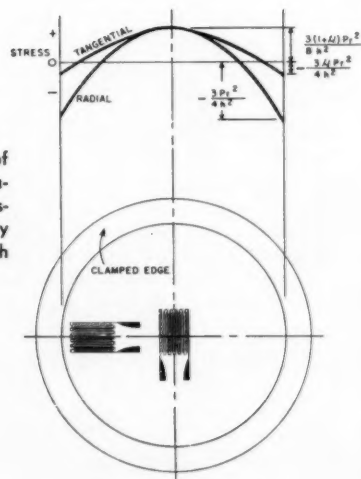


Fig. 1 Modified spark plug with annulus and connecting tube to pressure transducer

Fig. 3 Orientation of strain gages on diaphragm and stress distribution in a uniformly loaded diaphragm with clamped edges



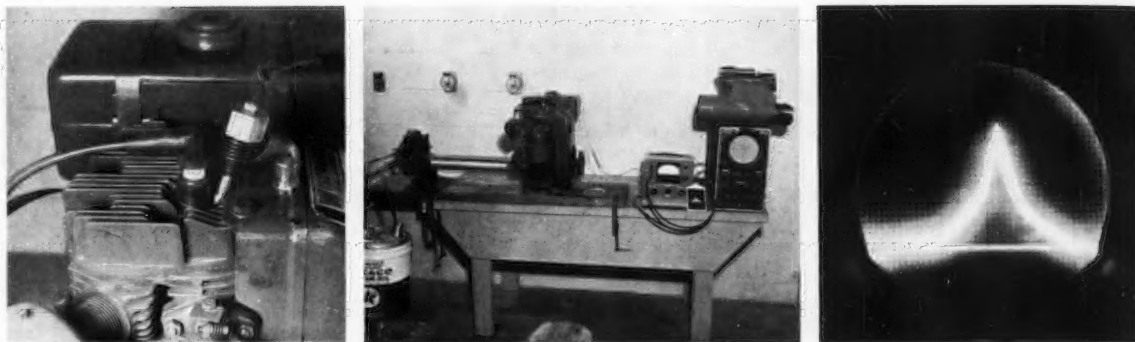


Fig. 4 (Left) Method of obtaining auxiliary air cooling for transducer • (Center) Equipment and instrumentation for obtaining pressure-time diagrams • (Right) Typical pressure-time photograph obtained with the Polaroid Land camera.

### Spark Plug Modification

The complete unit consists of two parts. The first portion in Fig. 1 shows the passage or pressure connection via the spark plug, from the engine cylinder to the pressure transducer, as illustrated in Fig. 2 (1)\*. The shank of a standard 14 mm spark plug was turned down on a lathe and two  $\frac{1}{16}$ -in.-diameter holes were drilled through the shank into the plug cavity. A grooved annulus was turned out on a lathe and placed on the spark plug shank between two spark plug washers. A  $\frac{1}{16}$ -in.-diameter hole was drilled longitudinally through a  $\frac{3}{16}$ -in.-diameter bolt, a matching  $\frac{1}{16}$ -in.-diameter hole was drilled through the side of the annulus, and the bolt was brazed to the annulus. The total volume of the assembly is 0.011 cu in. which is small enough not to alter appreciably the cylinder volume or offer enough inertia to reduce or dampen the pressure waves as they pass to the transducer.

### Pressure Transducer Design

The components of the pressure transducer are shown in Fig. 2. The high-temperature, foil-type strain gages (Baldwin FAH-06-6-B) were bonded to the diaphragm as indicated in Fig. 3. For these gages with a  $\frac{1}{16}$ -in. gage length and an over-all length of about  $\frac{3}{16}$  in., a  $\frac{3}{16}$ -in. diaphragm was chosen. The stress distribution for a thin uniformly loaded diaphragm with clamped edges is also shown in Fig. 3. The diaphragm thickness was calculated from the expression (2):

$$b = \sqrt[3]{\frac{8}{3}(1+\mu)Pr^2/eE}$$

in which  $b$  = diaphragm thickness, in.

$\mu$  = Poisson's ratio (in. per in.), 0.3 for steel

$P$  = unit pressure (lb per in.<sup>2</sup>), estimated at a maximum of 500 lb per in.<sup>2</sup>

$r$  = radius of diaphragm (in.),  $\frac{1}{4}$  in. unclamped radius

$E$  = modulus of elasticity (lb per in.<sup>2</sup>),  $30 \times 10^6$  for steel

$e$  = strain (in. per in.), 0.001, for allowable stress of 30,000 lb per in.<sup>2</sup>

The orientation of the strain gages on the diaphragm (Fig. 3) is such that the center gage is strained the maximum amount and the other gage is approximately at the point of neutral stress. The primary purpose of the second gage is to provide temperature compensation. The gages

\*Numbers in parentheses refer to the appended references.

were connected in adjacent arms of a Wheatstone bridge circuit, the bridge circuit being completed by the Ellis (BAM-1) amplifier and meter shown in Fig. 4 (center).

Fig. 4 (left) shows how auxiliary air cooling was provided for the transducer by means of a tube extending from the engine flywheel housing.

### Pressure-Time Diagrams Obtained

Engine cylinder pressure-time diagrams were obtained with the equipment and instruments shown in Fig. 4 (center). The bridge output from the Ellis amplifier was fed to the vertical sweep of the cathode-ray oscilloscope. A Polaroid Land camera was used to obtain a photograph of the pressure-time diagram. The single-cylinder engine was loaded by throttling the output of a gear pump driven by the engine.

Fig. 4 (right) shows a typical pressure-time diagram observed on the oscilloscope. The diagram is similar to an ideal pressure-time diagram. The point of initial combustion can be seen as the hump in the curve as the pressure is rising, and the opening of the exhaust valve can be seen as the hump in the curve as the pressure is falling.

Initially the transducer was not calibrated quantitatively. This will be done so that absolute values of pressure can be obtained as engine load, fuel-air ratio, or ignition timing is varied. In the preliminary tests conducted, satisfactory qualitative results were obtained to show the effect on peak pressure and rate of pressure rise as the above variables were changed.

### References

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### CORRECTIONS

Following publication, it was learned that captions for Figs. 1 and 2 used in the article entitled "Pulsating Pressures in an Internal-Combustion Engine Induction System," page 490 of the September issue of AGRICULTURAL ENGINEERING, were inadvertently transposed.

It also has been noted that a slight error appeared in the article entitled "Measurement of Shearing Energy," page 299 of the June issue of AGRICULTURAL ENGINEERING. The caption for Fig. 5 should have referred to "edge profile" rather than "energy profile".

# Effect of Tractor Traffic on Crop Yields and Soil Density

S. J. Bourget, J. G. Kemp and B. K. Dow

Assoc. Member ASAE

**T**RACTOR and heavy machinery traffic has caused much concern about possible soil compaction and reduced soil productivity. Compaction of soils to a depth of 9 in., as measured by bulk density determinations, was found possible by means of tractor tires (4, 5)\*. Maximum soil compaction occurred at moisture contents near the optimum plowing moistures. Instances where plant growth has been affected by compacted layers have been mentioned (1, 2, 3).

The purpose of the present study was to determine the effect of different rates of tractor traffic, after plowing and prior to seedbed preparation, on crop yields and on the persistence of any changes in soil physical properties under cropping and summer fallow treatments.

## Materials and Methods

The work was carried out from 1956 to 1959 on a North Gower clay loam which had the following texture: 28 percent sand, 33 percent silt, and 39 percent clay. Its lower and upper plastic limits were 27.4 and 47.1 percent, respectively. The optimum soil moisture, as indicated by the Proctor compaction test, was 21.0 percent for a maximum dry density of 1.60 g per cc. The soil bulk density, prior to compaction, averaged 1.35 for a depth of 3 to 6 in. and 1.38 for a depth of 9 to 12 in.

The experiment was carried out with three replicates in a split-plot design using five compaction treatments on 10 by 20-ft sub-plots and three cropping treatments on main plots. The compaction treatments consisted of 0, 8, 14, 20 and 26 rear tire passes of a tractor weighing 6,000 lb. One pass was accomplished by traveling over the plot a number of times with the tractor until its rear wheel had been over the entire plot. The rear tire size was 12-38 and the front tire 6.50-16.

The cropping treatments were oats seeded down to Ladino and timothy in one case and oats seeded down to alfalfa and timothy in the other. Another series of plots was summer-fallowed. A seedbed was prepared by disking the surface three inches of compacted soil. The rates of seeding were: oats, 2½ bu; alfalfa, 10 lb; Ladino, 3 lb, and timothy 10 lb per acre. An application of 400 lb per acre of 2-16-6 fertilizer was made at the time of seeding oats.

Composite samples for soil moisture determinations were taken at depths of 0 to 3, 3 to 6, 6 to 9 and 9 to 12 in. when the compaction treatments were applied. Core sam-

ples were obtained for bulk density and pore space determinations at depth intervals of 3 to 6 and 9 to 12 in., in 1957 and 1958.

## Results and Discussion

The soil moisture content, at the time the compaction treatments were applied, varied from 21.3 percent near the surface to 32.3 percent at the 9 to 12-in. depth. These moisture values represent the average of six composite samples, each made up of soil from 10 sites within the area. With the exception of the first 3-in. layer, the soil moisture content at the time of packing was higher than the optimum moisture content for maximum density by the standard compaction test.

An analysis of variance showed that the oat yields obtained on the uncompacted plots were highly significantly greater than all others. However, the differences in yields obtained on the 8, 14, 20 and 26 tractor passes treatments were not significant. No difference in yields of oats, seeded down to each of two different hay mixtures, was found. The yields of Ladino and timothy and of alfalfa and timothy hay in 1957 and 1959 tended to be higher on the unpacked plots than on any of the compacted plots, but these differences were not significant statistically.

Bulk density and porosity measurements made in 1957 and 1958 were not related to the number of tractor passes. If there were differences in 1956, they did not persist in the following years. Similarly, the summer fallow and cropping treatment did not produce significant differences in bulk density and porosity.

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## 1961 TRANSACTIONS of the ASAE

**T**HE General Edition of the 1961 TRANSACTIONS of the ASAE, Vol. 4, No. 1, containing 152 pages is off the press. Copies are available at \$6.00 each (\$3.25 to ASAE members). The second edition, containing at least 96 pages, will be a special edition devoted to technical articles on Power and Machinery subjects and will be published in December. Copies of the special edition will sell for \$4.00 each (\$3.00 to ASAE members). Combined price for both editions is \$8.00 (\$5.50 to ASAE members).

Paper prepared expressly for publication by the American Society of Agricultural Engineers and approved as contribution No. 23 from the Soil Research Institute and No. 12 from the Engineering Research Service, Research Branch, Canada Department of Agriculture (Ottawa).

The authors—S. J. BOURGET, J. G. KEMP, and B. K. DOW—are, respectively, soil physicist, agricultural engineer, and assistant technician, Research Branch, Canada Department of Agriculture.

\*Numbers in parentheses refer to the appended references.

## ... Graphical Determination of Pipe Size

(Continued from page 551)

The two derived relations for most economical pipe size diameter are as follows:

For steel pipe

$$D_6 = \frac{4.69 \times 10^{-4} f t C Q^3}{Re \left[ \frac{i(i+1)^n}{(i+1)^n - 1} \right]} \quad [1]$$

where  $D$  = pipe diameter in inches

$f$  = Darcy friction factor

$C$  = cost in dollars per horsepower-hour to overcome friction

$t$  = total number of hours of operation per year

$R$  = ratio of cost of pipe in dollars per foot to pipe diameter in feet

$e$  = pump efficiency, percent

$i$  = interest rate, percent

$n$  = expected life of pipe in years

$Q$  = flow rate in gallons per minute

For aluminum pipe

$$D^7 + 1.46 D^6 = \frac{7.91 \times 10^{-4} f t C Q^3}{Pe \left[ \frac{i(i+1)^n}{(i+1)^n - 1} \right]} \quad [2]$$

where  $P$  = cost of pipe in dollars per pound. All other terms are the same as for steel pipe.

To make a multivariable coaxial plot of these two equations requires holding all but one of the independent variables constant while iterating over the range of variation of

this single variable. This is a tedious procedure with seven variables and consequently the two relations were programmed for solution on an IBM 650 computer. Each variable was incremented over what was considered its normal range of variation. The machine made the calculations and provided the mass of data from which the two figures were plotted in approximately twenty minutes.

Although not adaptable to every pipe selection problem, Figs. 1 and 2 should give good engineering results if their use is limited to sizes and types of aluminum and steel pipe commonly used in irrigation systems. They not only permit rapid computation of economic pipe size for given conditions, but have flexibility in that effects of certain changes in the design variables can be quickly compared. They can also be useful for evaluation of existing designs.

## ... Rate of Tile Flow

(Continued from page 549)

4 Lynde, H. M. Tile drainage investigations in North Carolina. *AGRICULTURAL ENGINEERING* 2:133-135, 1921.

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## Graduate Student Considers Reality Before Convenience

(Right) Rama K. Srivastava, ASAE Associate Member from India who soon will receive an M.S. degree in agricultural engineering from the University of Massachusetts, has spent two summers evaluating various hand methods of harvesting grain. He intentionally selected hand implements which he felt best suited the agricultural economy and land tenure system in his native country rather than modern American equipment. The traditional Indian implements of grain harvest, he is convinced, are inefficient in both the time and the energy they require. In his studies he used Indian, Japanese, European and American scythes, an American cradle, and a hand-powered Japanese "Nissan" portable harvester to harvest small plots of oats, rye, buckwheat and barley. These crops were used in lieu of the usual Indian grains—rice, millet and wheat.

The entire experiment was sponsored by the department of agricultural engineering at the University of Massachusetts, and aided by the International Cooperation Administration. Results of the studies revealed that American hand tools ranked first in efficiency with the cradle leading and the scythe close behind. However, the European scythe, with its straight blade and the fact that it is about two-thirds the size of the American version, appears to be the most practical for Indian farmers to adopt, since it seems to be best suited (in size and weight) to the average-sized Indian farmer. Shown with Srivastava (at extreme right) are Anandi P. Bhatnagar (left), holding a cradle, as

## AE Students Win LSU Trophy

(Left) Each year on Engineers Day at Louisiana State University a trophy is awarded for the outstanding department exhibit. Students in the agricultural engineering department have won this trophy two years out of the past three. Shown standing in front of this year's trophy are three agricultural engineering seniors, who graduated in June. Left to right are: B. G. Lambert, who had one of the highest scholastic records in the College of Engineering, and who is now employed by the Louisiana Power and Light Co. in New Orleans; W. G. Dodge, who has obtained an assistantship in the department of engineering mechanics at LSU and expects to work for an advanced degree in mechanics and perhaps an additional degree in agricultural engineering; and B. J. Garrett, who is now affiliated with the U.S. Department of the Interior, working on a dam to be built near Page, Ariz.



Bireswari P. Singh (center) harvests grain with a Japanese "Nissan" portable harvester. All three are graduates of the University of Allahabad in India. Project is under the direction of C. A. Johnson, associate professor, agricultural engineering department, University of Massachusetts

## ... Total-Agriculture Concept of Agricultural Engineering

(Continued from page 541)

these has from one to several hundred engineers on its staff. The assistant chief engineer of one of the nation's largest food companies recently stated that 33 percent of their executives were engineers. In the field of processing, the agricultural engineer, with his understanding of the importance of sanitation and biological and bacteriological factors, is ideally qualified not only to design equipment and carry on research, but he would also be qualified to serve in a management position, in developing plant layouts, in process development, design of equipment, research on automation problems, and quality control. There are also opportunities in teaching and research.

An example of the interest in this field is the fact that the agricultural engineering department at Michigan State University for the past nine years has held an annual two-day dairy engineering conference, which now attracts an attendance of 275 persons from many states each year.

The demand for capable engineers to serve in this area is many times greater than the supply. Several college agricultural engineering departments have already taken steps to train engineers for this need.

In the field of transportation and handling, the agricultural engineer can be an important member of a team dealing with food products. In transportation, a product must be moved in such a way that its quality is maintained. Then there is need for engineers who can give special attention to the effect of refrigeration, vibration, light, radiation, pressure, etc., on the product being transported or handled.

We are entering the space age. One of the problems facing astronauts is how to keep alive while out in space. Perhaps here again the agricultural engineer can be an important member of the team that does the research, builds the equipment and works out processes for maintaining life for extended periods of time in a special man-made environment.

Many feel that we have been through the electrical age and, at least for agricultural engineers, that the interest for some years now has been on the down-grade. A great effort was made to bring electrical energy to the farms of America. This has been pretty largely accomplished and many companies and organizations have felt that the big job has been done. However, it would seem to me that the job has only begun. Electricity, the great servant of man, can be used in so many ways to accomplish desirable results, making farm life easier, and reducing cost of production, etc. New developments have indicated that there are great possibilities in the use of special kinds of light, in electrical energy for heating of homes, in automatically-controlled processes and in numerous special uses around the farmstead. Electronics as applied to agriculture is just beginning. There are many important jobs to be done by agricultural engineers in this field, and we must move ahead.

Communications is another area in which the agricultural engineer might extend his activities. Through radio, television, special telephone setups, there are many new possibilities for automation which will reduce cost and improve the lives of farm people.

The home should be the object of much effort on the part of agricultural engineers. They are temperamentally suited for the job of making home life more enjoyable through improved structures, machines and environment. This is a great, untapped field in which no particular engineering group is working in an organized fashion at the present time. Many of the problems confronting the urban population would also be solved if they were solved for the rural population. Some of these problems are more effective and efficient waste disposal, improved environmental control, reduced cost of building, and safety around the home and farmstead.

### How to Meet the Challenge

The agricultural engineering profession will continue to grow along the lines of its past development, but it will be missing

a great opportunity if it does not find a way to extend its services and interests to agriculture in the broader concepts mentioned above.

To develop its maximum potential, it is suggested that the profession carefully review the fields of activity enumerated, and then devise, through ASAE, a plan of action dealing with those areas in which it can be of real service.

Such an action program might be initiated along the following lines:

1 New groups, divisions or sections might be organized to deal with areas not now covered or inadequately covered.

2 A system of training leaders in these various areas would be needed. The support of related industry should also be secured.

3 A good job of training both fundamentally and in special fields needs to be done in any area which it is intended to develop. New courses will need to be established and professional groups set up within the Society.

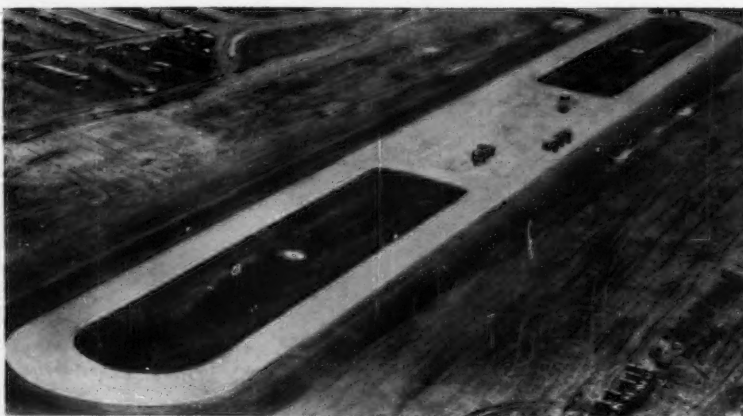
4 Improvements must continue to be made in the present areas served by the Society and the profession, as the production phases of agriculture will always be of prime importance to agricultural engineers.

The opportunities for service in the broad field of agriculture for agricultural engineers are truly enormous. Serving a 90 billion dollar a year industry—our most basic industry—should challenge agricultural engineers for years to come. Our success will depend on how well we train ourselves to be of service and on our recognition of opportunities and needs as they arise. We need to be forward looking and diligent in all our efforts.

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## OLIVER CONSTRUCTS TRACTOR TEST TRACK



A new 1/2-mile concrete test track has been completed at the Charles City (Iowa) plant of Oliver Corp., for use in research and testing of wheel tractors for farm and construction applications. The main track of the new testing facility is 18 feet wide on straightaways and 30 feet wide on turns and will be used for continuous endurance testing of tractors under simulated load conditions. An additional inner track has been added for extreme shock loading in conjunction with stress analysis of equipment conducted on a course created by various arrangements of beams and other obstacles.

The new test track will be under guidance of F. J. Pryatel, Charles City plant manager, with H. K. Dommel, supervisor of wheel tractor experimental engineering, directing test operations.

# CHECK POINTS

by J. L. BUTT



## ALL ROADS LEAD TO —

ASAE will achieve a 54-year peak of activity during the forthcoming winter meeting. Round-the-clock functions (almost) have been scheduled over a 4-day period to give registrants a choice of informational events unparalleled in Society history. Every member should make a special effort to attend this meeting—and bring along interested business associates.

Let's run through the major events — new and old — so you can begin making the tough decisions as to which are of greatest interest to you. One thing is certain — there will be plenty of interesting activities to keep you fully occupied and make the meeting a highly profitable one.

First, there will be the usual five concurrent divisional technical sessions from 8:00 a.m. (yes, eight!) to 3:00 p.m., with a short luncheon break. The divisional programs are tops with many highly interesting papers on new developments (your official programs should reach you in early November).

Then, there will be more than 70 committee meetings utilizing the time between 3:00 p.m. and midnight (or later). These committees will be working on technical, professional and educational matters, and many are open to all interested persons (some are closed meetings). The list of open committee meetings will be posted on the bulletin board near the registration desk.

The usual Personnel Service Contact Session will be held to give employers and those seeking employment (particularly recent graduates) an opportunity to make contact with one another. We anticipate that about 50 employers and perhaps 125 recent graduates will participate in this event.

One of the new activities added this year will be a series of open forums, scheduled for 8:00 p.m. on Wednesday and Thursday evenings, to explore certain subjects. The format for the forums varies, but in general the stage will be set by a few brief, prepared statements, and then the discussion will be opened to audience participation. Looks like an excellent means of getting at the heart of certain agricultural engineering problems — and perhaps of developing some possible courses of action, or giving direction to research and development efforts.

Another major new feature of the meeting will be the first ASAE-sponsored commercial exhibit activity. The Agricultural Engineering Exposition promises to offer valuable technical information on new products, techniques, devices, materials, and practices specifically directed to the interests of agricultural engineers. It should prove to be of particular interest to design engineers and company executives and those engaged in teaching, research and extension. Take

advantage of this opportunity to arm yourself with the very latest information available from exhibiting companies. The Exposition will open on Tuesday, December 12 (a day ahead of the technical sessions), and will be open for three days between the hours of 2:00 p.m. and 9:00 p.m.

Also on Tuesday, December 12, there will be a special conference, not actually a part of the Winter Meeting but intentionally scheduled for December 12 to make it easier for interested members to attend. The theme of the conference will be "Tooling Up for Systems Farming," and the meeting is sponsored jointly by ASAE and the Farm Equipment Institute (FEI). This joint effort will bring together the full management team (engineers, economists, marketing specialists and other executives) to look ahead to the problems, needs and planning which will be associated with the development of systems farming in the years ahead. Particular emphasis will be

given to the engineering requirements, manufacturers' responsibilities, dealers' responsibilities, and standardization. You will receive a copy of the complete program, probably with your Winter Meeting packet.

Finally, there will be the usual opportunity for "between-session" informal visits with those in work related to your own, the chance to select your choice of the technical papers presented at the meeting, the opportunity to inspect certain educational exhibits, an outstanding General Session of broad professional interest, and special conferences on extension and research.

You will go home exhausted from the pace of the meeting; but you will be enriched by an educational experience that will enable you to look forward to 1962 with renewed zeal and enthusiasm. You will perhaps be frustrated at times during the meeting because you can't be at two or more places at the same time; but we submit that this is better than to have only one choice of events with the chance that the subject covered might not be of interest to you.

So we urge you to plan now to attend this meeting which will present and abundant choice of agricultural engineering information and activity — and equip you with new facts and knowledge for more productive personal performance in the future. See you in Chicago!

## EVENTS CALENDAR

October 17-19 — *8th Annual Lubrication Conference*, Morrison Hotel, Chicago, Ill. Sponsored jointly by the American Society of Lubrication Engineers and the American Society of Mechanical Engineers. For information write to American Society of Lubrication Engineers, 5 N. Wabash Ave., Chicago 2, Ill.

October 19 — *Fifth International Course in Hydraulic Engineering*, Delft, Netherlands (for eleven months). Information may be obtained from Netherlands Universities Foundation for International Cooperation, 27 Molenstraat, The Hague, Netherlands.

October 19-20 — *1961 National Conference on Industrial Hydraulics*, Sherman Hotel, Chicago, Ill. Information may be obtained from Illinois Institute of Technology, 35 W. 33rd St., Chicago 16, Ill.

October 19-21 — *National Society of Professional Engineers Fall Meeting*, Hotel Roanoke, Roanoke, Va. For further information contact NSPE, 2020 K St., N.W., Washington 6, D. C.

October 20-22 — *Eastern Lawn and Garden Trade Show*, New York Coliseum, New York, N. Y. Write to ELGTS, Suite 1103, 331 Madison Ave., New York 17, N. Y., for information.

October 22-25 — *Centennial Nutrition Conference*, Hotel Muehlebach, Kansas City, Mo. Contact Midwest Feed Manufacturers' Association, 20 W. Ninth St. Bldg., Kansas City 5, Mo., for details.

October 22-27 — *Dairy Industries Supply Association, International Association of Ice Cream Manufacturers, and Milk Industry Foundation Conventions*, Washington, D. C. For further details contact T. L. Jones, Room 512, 1145 19th St., N.W., Washington 6, D. C.

November 2-3 — *Agriculture-Petroleum Seminar*, Louisiana State University, Baton Rouge, La. Contact American Petroleum Institute, 1271 Avenue of the Americas, New York 20, N. Y., for information.

November 6 — *48th Annual Convention of the National Warm Air Heating and Air Conditioning Association*, LaSalle Hotel, Chicago, Ill. Contact NWAHACA headquarters, 640 Engineers Bldg., Cleveland 14, Ohio, for details.

November 6-8 — *Annual Convention of Structural Clay Products Institute*, Shoreham Hotel, Washington, D. C. Details may be obtained from SCPI, 1520 18th St., N.W., Washington 6, D. C.

November 8-10 — *48th Annual Convention of the National Warm Air Heating and Air Conditioning Association*, LaSalle Hotel, Chicago, Ill. Details may be obtained from association headquarters, 640 Engineers Bldg., Cleveland 14, Ohio.

November 13-17 — *National Electrical Manufacturers Association Annual Meeting*, Traymore Hotel, Atlantic City, N. J.

November 17-23 — *Farm-City Week*.

November 27-30 — *Annual Meeting of the American Society of Agronomy*, Sheraton-Jefferson Hotel, St. Louis, Mo. Write to ASA, 2702 Monroe St., Madison 5, Wis., for information.

February 12-13 — *Fertilizer Technology Short Course*, Purdue University, Lafayette, Ind. Sponsored by the Soil Science Society of America. Contact SSSA, 2702 Monroe St., Madison 5, Wis., for information.

March 6-11 — *33rd International Machinery Show*, Paris, France. For additional details write to Robert de Wilde, Agricultural Attache, 1001 Connecticut Ave., N.W., Washington 6, D. C.



### New Fellowship Program

L. M. K. Boelter, dean of the College of Engineering, University of California, has announced the initiation of a series of pre-doctoral and post-doctoral fellowships for the next several years. The fellowships are part of the Educational Development Program, an organized faculty effort, supported by the Ford Foundation and directed toward further improvement of UCLA's unified approach to engineering education. A prime objective of the fellowships is to provide an opportunity for persons to study while contributing to EDP through supplementary part-time employment on EDP projects or the teaching of core courses in UCLA's unified undergraduate program. A related objective is to encourage persons to complete a doctorate in engineering and to increase the available supply of persons well prepared for a career in engineering education. Inquiries regarding fellowship and employment opportunities may be directed to William D. McIlvaine, Secretary, Educational Development Program, College of Engineering, University of California, Los Angeles 24, Calif.

### ASAE Charter Member Dies

Elmer W. Hamilton, Charter-Life Fellow, died on August 6 in Madison, Wis., at the age of 82. He was born and raised on a farm near Arena, Wis. He graduated from the University of Wisconsin in 1904 with a B.A. degree and following graduation he became editor of the *Canadian Thresherman* in Winnipeg, Canada. He inaugurated the Winnipeg Motor Contests in 1908, which were held each July through 1912, to provide an opportunity for tractor manufacturers and agricultural engineers to study the possibilities of the gas tractor as mobile mechanical power in the field and on the belt. The contests made gas tractor history as both steam and gas were given the opportunity to work side by side under the same conditions.

In 1924 he sold his publishing business in Canada and returned to Madison, Wis., where he was associated with Bascom B. Clarke in publishing the *American Thresherman and Gas Review*. He joined Allis-Chalmers Mfg. Co., Milwaukee, Wis., in 1939 to work on the study of grasses, particularly as they pertained to hay and grass silage, and to follow the development of mechanized forage handling equipment. For several years he traveled throughout the United States and Canada observing the development of mechanized grass-handling equipment in different sections of the two countries. He retired from Allis-Chalmers in 1956. After retirement he authored a book entitled "Man and Grass."

At a special business meeting, held during the 1957 Winter Meeting in Chicago, the Board of Directors of ASAE corrected an oversight of long standing when it voted to recognize Mr. Hamilton as a Charter Member of the Society. This action followed the uncovering of supporting evidence by the Committee on ASAE History, indicating that he attended the organizational meeting of the Society in December 1907. It happened that two E. W. Hamiltons attended that first meeting at Madison,

### Forms Agricultural Lubrication Division

Lubrication Engineers, Inc., Fort Worth, Texas, a firm devoted exclusively to custom-built lubricants for heavy equipment, has established a special agricultural lubrication division. The purpose is to offer the farmer more specialized lubrication all the way from engineering products, particularly with farm machinery in mind, to specific field application of the lubricants. In announcing plans of the new division it was revealed that approximately 300 additional franchises will be opened.

### Fertilizer Short Course

The Soil Science Society of America will sponsor a Fertilizer Short Course at Purdue University on February 12 and 13. Speakers will present the most recent information available on fertilizer manufacturing, the economic aspects, technology, and resources and use in the United States. Further details may be obtained by contacting SCSA, 2702 Monroe St., Madison 5, Wis.

### Publications Committee Meets

A meeting of the Publication Policies and Finances Committee was held in the offices of the Portland Cement Association in Chicago on October 4. The meeting was called by Chairman M. L. Burgener in order that the group might review the Society's publications and establish possible recommendations.

During the day-long meeting the group considered objectives of the Society's publi-

cations and developed preliminary recommendations to be presented to the ASAE Board of Directors at the Winter Meeting. Chairman Burgener requested that a statement appear in *AGRICULTURAL ENGINEERING* inviting ASAE members to send their comments concerning ASAE publications to M. L. Burgener, Manager, Farm Bureau, Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill. Members of the committee in attendance in addition to the chairman were: H. H. Beaty, W. F. Buchele, S. S. DeForest, and R. R. Poynor. Others attending were G. L. Nelson, technical advisor, Farm Structures Division; J. L. Butt, executive secretary; and J. A. Basselman, editor.

### EPP Paper Titles Needed for ASAE 1962 Annual Meeting

The ASAE Electric Power and Processing Division has issued a call for paper titles for the June 1962 Annual Meeting. Information should include: Title of paper, authors, length of paper, brief abstract of paper (less than 50 words—this abstract not to be published). Technical sessions are scheduled in the following fields: (1) biological engineering, (2) automatic controls, (3) electric power, (4) environmental control, (5) food engineering, and (6) crop processing. If adequate papers are not available for any one of these sessions, then papers outside the range of these topics will be used to complete the program. This information should be sent to the chairman of the Program Committee, K. H. Norris, 105A South Administration Building, Plant Industry Station, Beltsville, Md., by December 9, 1961.

### ASAE Publications in International Abstracts

Robert M. Peart, associate professor of agricultural engineering at Purdue University, will serve as a reviewer for a new publication entitled "International Abstracts in Operations Research." In addition to helping review other publications, he will review *AGRICULTURAL ENGINEERING* and the *TRANSACTIONS* of the ASAE. These publications will be among some 160 such United States publications to be reviewed.

### ASAE Members Attend Engineering Teacher Institute

The four following ASAE members, representing various agricultural engineering departments, attended the second annual Summer Institute for Engineering Teachers August 27 to September 9 at Pennsylvania State University: W. L. Harris, assistant professor, University of Maryland; R. W. Hansen, assistant professor, Colorado State University; S. G. Huber, associate professor, Ohio State University; and B. A. Stout, associate professor, Michigan State University. They were four out of 70 university engineering teachers from throughout the nation who were accepted to participate in the institute, sponsored by Pennsylvania State University in cooperation with the American Society for Engineering Education and the Engineers' Council for Professional Development. The two-week conference was designed to provide participants with training in fundamental principles and use of effective teaching methods, further educational and professional orientation, and encouragement of research in improved teaching methods.

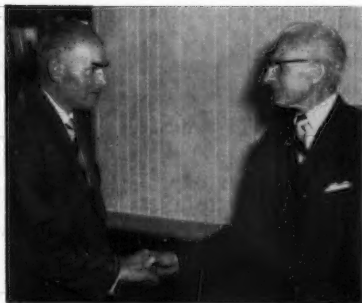
### Materials Handling Essay Contest

The theme of the ninth annual essay contest, sponsored by the Industrial Truck Division of Clark Equipment Co. and conducted by the American Material Handling



E. W. HAMILTON

Wis.—Everett W. Hamilton of the agricultural engineering department at Iowa State University and Elmer W. Hamilton, editor of the *Canadian Thresherman*, Winnipeg, Canada. When the roster was made up from registration cards of those in attendance it was apparently thought that the two E. W. Hamiltons were one and the same person, and one card was inadvertently destroyed. Therefore, the name of Elmer W. Hamilton was omitted from the list of Charter Members. Since no record of membership had been made for Elmer Hamilton, he rejoined ASAE in 1908 and served as treasurer of the Society in 1910. In 1941 he was one of the founders of the Joint Committee on Grassland Farming (now American Grassland Council) and served on its executive board for several years. He was made a Life Member in 1945 and elected to the grade of Fellow in 1955.



During several weeks in September and October, Professor Hans Sack (left) director, Institute of Agricultural Engineering, Technical University of Aachen in Germany, visited in the United States to discuss agricultural engineering education and research with agricultural engineering departments and various manufacturing organizations. He also visited and spoke at several ASAE Section meetings. Included in his itinerary was a visit to ASAE headquarters. While there, he was pleased to greet Raymond Olney (right), former editor and secretary of ASAE, with whom he had corresponded many times as technical director of Rud, Sack Implement Works, Leipzig, and later as the owner of his own company for the construction of special farm machinery.

Society, is "Cost Reduction Through Materials Handling." Contestant should discuss one or more unsolved materials handling problems within industry or government, and propose one or more solutions for cost reduction. Problems anticipated in the future or existing problems yet unsolved may be discussed. Papers will be judged on analysis of subject, value in the field, originality, organization of material and use of visual aids. The contest closes April 1, 1962. For the best papers submitted on the chosen theme there is a \$2,000 first prize and nine other prizes totaling \$3,000. Complete details and rules of the contest may be obtained from local chapters of the American Material Handling Society or by writing to Industrial Truck Division, Clark Equipment Co., Battle Creek, Mich.

#### ASTM Changes Name

The name of the American Society for Testing Materials was officially changed to

the American Society for Testing and Materials with the signing of a court decree on September 18, amending the Society's charter. In announcing the change, ASTM President Miles N. Clair stated that the inclusion of the word "and" in the Society's name places added emphasis on its research work in seeking knowledge of the nature of materials.

#### ASAE Recognizes Wyoming Curriculum

The Board of Directors of ASAE, upon recommendation of the Committee on Curriculum and Course Content and the Executive Committee of the Education and Research Division, has recognized the agricultural engineering curriculum at the University of Wyoming effective September 18. The curriculum henceforth will be listed among the ASAE-recognized curriculums in the AGRICULTURAL ENGINEERS YEARBOOK and its graduates are eligible for Associate Member grade in ASAE.

#### First International Conference on Soil-Vehicle Systems

Several ASAE members joined technical authorities from 16 other countries at the First International Conference on the Mechanics of Soil-Vehicle Systems held in

Torino, Italy, June 12 to 16. In addition to M. G. Bekker, Defense Systems Division, General Motors Corp., Santa Barbara, Calif., who, it is reported, conceived the idea of the conference and served as its U.S. secretary, the following ASAE members attended from the United States: W. F. Buchele, associate professor of agricultural engineering, Michigan State University; A. W. Cooper, director, and G. E. Vandenberg, agricultural engineer, USDA National Tillage Machinery Laboratory, Auburn, Ala.; and G. W. Steinbruegge, professor of agricultural engineering, University of Nebraska. ASAE members attending from outside the United States were: M. Weinblum from Israel; G. Stefanelli, G. F. Priorelli, F. Negro, and F. Torazzi from Italy; and H. Meyer and H. von Sybel from Germany.

The purpose of the conference was to draw to the attention of technicians the various problems related to the soil-vehicle systems in off-the-road locomotion and to promote the dissemination of studies conducted in various countries and particularly in the United States.

Selection of time and place for future meetings will be made by the group of national secretaries—one from each country represented. For further details contact

(Continued on page 575)

#### NEW DEPARTMENT HEAD AT TEXAS TECHNOLOGICAL COLLEGE

W. L. Ulich has been named head of the agricultural engineering department of Texas Technological College. He is a native of Somerville, Texas, and received a B.S. degree in 1943 and an M.S. degree in 1947 in agricultural engineering from A. and M. College of Texas. He also received a doctorate from Harvard University in public administration. Mr. Ulich studied for an M.S. degree under a fellowship provided by the Texas Association and at



W. L. Ulich

Cottonseed Crushers Association and at

Harvard under a Carnegie Fellowship. He joined the U.S. Air Corps in 1943, immediately after graduating from college. He holds several decorations including the DFC. At the present he is a major in the Air Force Reserves. In 1947 he became state farm labor shop supervisor and in 1948 became affiliated with the extension service as assistant agricultural engineer. He was made extension agricultural engineer in 1949.

He is well known for his leadership in the fields of farm machinery and safety and has been loaned on several occasions to other states to help them get similar programs underway. He also provided the leadership for Extension's farm safety programs for youth as well as adults. He will succeed Ira Williams, current acting head of the department, who will return to full-time teaching at Tech this fall.

#### CONNECTICUT VALLEY SECTION OF ASAE CONDUCTS FFA PROGRAM

The Connecticut Valley Section of ASAE each year presents a trophy to Future Farmers of America chapters for the outstanding educational exhibit at the Eastern States Exposition. The award is presented for the exhibit which best depicts agricultural engineering in an effort to attract members of the FFA into this important field. This year the award was presented to the Mattabeset Chapter of FFA in Middletown,

Connecticut, for an interesting exhibit that showed a farm pond supplying water for irrigation and fire protection. Roger Ruske (right) a member of the Mattabeset Chapter, is shown accepting the award from James H. Whitaker, chairman of the Connecticut Valley Section. The Mattabeset Chapter also received the top award for having best over-all FFA educational exhibit at the Exposition.



The Connecticut Valley Section also prepared a display that attracted much attention during the Exposition. The ASAE motion picture, "Agricultural Engineering—the Profession with a Future" was shown continually to FFA members.



**L. E. Jolls** recently has been appointed quality control manager, domestic operations, for Ford Tractor Operations, Ford Motor Co. In this capacity he will have functional responsibility for the quality control activities of the Ford Highland Park (Mich.) Tractor Plant, the Royal Oak (Mich.) Equipment Plant, and the Des Moines (Iowa) Implement Plant. Prior to the establishment of Ford Tractor Operations, he was manager of the quality control department of the Ford Tractor and Implement Division.

**J. T. McAlister**, conservation equipment engineer, Soil Conservation Service, USDA, has been promoted and assigned to cover ten southern states in promoting the practice of mulch tillage. In this capacity he will have charge of a southwide mulch tillage workshop, which will be held at Perry, Ga., November 14 to 16. The theme of the meeting is "Mulch Tillage Can Boost Farm Income, Conserve Soil and Water." Specialists in charge of the promotion of mulch tillage practice in the ten states, along with representatives from farm equipment branch houses and distributors serving the southern territory, will attend.

**Donald L. Branton** has joined the Paragon Electric Co., Inc., Two Rivers, Wis., as product specialist of the Commercial and Farm Divisions. He previously was farm electrification advisor with Wisconsin Public Service Corp., Green Bay, Wis.

**Larry E. Stewart** has accepted an appointment as extension instructor in agricultural engineering at the University of Maryland. In this position, he will serve as extension agricultural engineering specialist in the field of power and machinery, and materials handling equipment and systems.



L. E. Jolls



J. T. McAlister



D. L. Branton



L. E. Stewart

He previously had been employed as a graduate assistant at West Virginia University.

**Gerald M. White** has accepted a position as assistant professor in the agricultural engineering department at the University of Kentucky, where he will teach and do research in the area of electric power and processing. He was formerly assistant professor of agricultural engineering at Purdue University.

**Mansel M. Mayeux**, associate agricultural engineer, Louisiana State University, has been recalled into the military service for one year. As lieutenant colonel he will be stationed at Fort Polk, La., as post engineer.

**John S. Balis** has joined the Board of Missions of the Methodist Church as a technical missionary and expects to go to Allahabad Agricultural Institute in India sometime early in 1962. His work there mainly will be teaching in the agricultural engineering department. He formerly was an instructor in agricultural engineering at Purdue University.

**Robert A. Wiles** has accepted the position of agricultural engineer with the Bureau of Land Management, working in the soil and moisture section. This section is concerned with the design and construction of detention reservoirs, water spreader systems, and other water conservation practices on federal land. He previously was a graduate research assistant in the agricultural engineering department of South Dakota State College.

**John F. Cykler**, previously head of the agricultural engineering department at Pineapple Research Institute of Hawaii, has accepted the position of director of research and development with the Lihue Plantation Co. at Lihue, Kauai, Hawaii.

**Robin R. Grinnell**, formerly a teaching assistant in the agricultural engineering department at the University of Minnesota, has taken a position at the Ontario Agricultural College.

**Volney H. Smith** has been promoted to the position of area engineer with the USDA Soil Conservation Service and has been transferred to Council Bluffs, Iowa. He previously was agricultural engineer with SCS at Denison, Iowa.

**Benny H. Warren**, formerly product sales representative, farm tractors, International Harvester Co., has been appointed general supervisor of industrial tractors and equipment sales.

**James C. Wright**, formerly assistant district manager, Indianapolis FE district, International Harvester Co., has been appointed product sales representative of farm tractors at the IH Louisville Works.

**Lawrence L. Elder**, assistant manager, dehydrator division, Sinton and Brown Co., spent two weeks during the month of August on active duty training at the Sixth U.S. Army Scientific Seminar. The seminar was conducted at the Davis Campus of the University of California.

**Paul Yates**, agricultural engineer, U.S. Sedimentation Laboratory, University of Mississippi, has been assigned by the Laboratory to the Southern Piedmont Research Station staff at Athens, Ga. He will conduct research work in streamflow and sedimentation.

**Walter D. Lembke** has joined the agricultural engineering staff at South Dakota State College as an associate professor. He previously was an instructor in agricultural engineering at Purdue University.

**William F. Lytle**, formerly assistant professor of agricultural engineering, Louisiana State University, has accepted the position of associate professor of agricultural engineering at South Dakota State College.

**Donn G. DeCoursey** has accepted the position of hydraulic engineer with the Soil and Water Conservation Research Division, ARS, USDA. He formerly was affiliated with the Indiana Flood Control and Water Resources Commission.

**James B. Mattson** has returned to Minnesota where he is working for the plant service department of the University of Minnesota as senior engineer. He previously was located in LaCrosse, Wis., where he was a service engineer for Rilco Laminated Products, Inc.

**Donald H. Petersen**, agricultural engineer, Soil Conservation Service, USDA, Anoka, Minn., has been transferred to Milwaukee, Wis. He will spend the next two years with the structural design section of SCS.

(Continued on page 571)

## NECROLOGY

**Yngve Andersson**, chief research leader, Swedish Institute of Agricultural Engineering, Uppsala, Sweden, died on May 29, following a severe illness. A native of Sweden, he was born December 5, 1896. He received a degree in agronomy from the Agricultural College at Alnarp, Sweden, in 1923 and after graduation became assistant extension service man for the Agricultural Society of the province of Ostergotland, Linköping, Sweden. He was affiliated with the Swedish Association of Agricultural Engineering as research leader from 1927 through 1945, with the exception of a three-year period (1938-1940) when he was with the farm machinery plant of Arvika-Verken (manufacturers of agricultural machinery) as an agronomy consultant. In 1945 the Swedish Institute of Agricultural Engineering was founded and he was ap-



Y. Andersson

pointed chief research leader and assistant director. He also had served as part time teacher at the Farm Machinery Institute of the Royal Agricultural College of Sweden.

Since 1928 Mr. Andersson had been actively engaged in research and experimental work in the field of farm machinery design and use. His main interest was the development of harvesting techniques in different respects, which was of special importance to Sweden because of its climatic conditions. He carried out several extensive investigations, particularly on fodder conservation and, in recent years, on mechanical potato harvesting; but his manifold interests included many other aspects of agricultural engineering. Through study tours to other European countries and to the United States, he made many contacts with foreign research workers.

He was the author of several instruction books on farm machinery and wrote a great number of articles on agricultural engineering subjects, including silage making methods and potato harvesting equipment. He had been an ASAE member since 1947 and was also a member of the Swedish Royal Academy of Agriculture.

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### North Atlantic Section

Fredericton, in the maritime province of New Brunswick, Canada, proved a popular location for the North Atlantic Section meeting August 20 to 23. Registered attendance included 144 members, 42 wives, 106 children, and 6 other guests—a total of 298.

ASAE President Byron T. Virtue opened the General Session Monday morning, Aug. 21, with an illustrated presentation describing the functions and facilities of the ASAE national headquarters office. The remainder of the General Session had as its theme "Agricultural Engineering Related to Marketing" and was moderated by E. G. McKibben, director, AERD, ARS, USDA. Speakers were R. W. Kleis, head, agricultural engineering department, University of Massachusetts; D. W. Winter, agricultural engineer, AMS, USDA; and R. O. Gilden, agricultural engineer, FES, USDA. A paper prepared by L. E. Holman also was presented by Mr. Winter. Some outstanding papers were presented during the Monday afternoon and Tuesday morning technical sessions. A complete review of the program was reported on page 376 of the July issue of AGRICULTURAL ENGINEERING. Exporting American technical assistance abroad and agricultural engineering's role in technical assistance were covered during the General session Tuesday afternoon, by R. A. Polson,

professor of rural sociology, Cornell University, and C. A. Johnson, associate professor of agricultural engineering, University of Massachusetts.

During the business meeting, a resolution to recognize the value of the agricultural engineer to civil defense and survival following a possible nuclear war was approved.

Also, the following officers were elected for 1961-62: W. C. Wheeler, chairman; A. G. Fox, vice-chairman; H. E. Gulvin, secretary-treasurer; N. C. Teter, R. L. Green, and H. W. Kitching, nominating committee. It was announced that Morgantown, W. Va., has been tentatively selected as the location for the 1962 annual meeting.

### Chicago Section

The Chicago Section held a dinner meeting on October 9 in the Monroe Parlor of the Palmer House, Chicago. The featured speaker of the evening was Harold F. Sommerschild, Stanley Engineering Co., who is the state president of the Illinois Society of Professional Engineers. In his presentation and during a discussion period he answered many questions about professional registration.

### Virginia Section

The annual meeting of the Virginia Section will be held October 20 and 21 on the campus of Virginia Polytechnic Institute. The program on Friday will include reports on research and tours of nearby research projects. C. W. Suggs, research instructor in agricultural engineering, North Carolina State College, and R. E. Stewart, head, agricultural engineering department, Ohio State University, will be featured on the program, along with members of the VPI research staff and USDA personnel. M. A. Hubbard, executive secretary, Virginia Farm Bureau Federation, will be the guest speaker at the

## ASAE MEETINGS CALENDAR

October 18—CONNECTICUT VALLEY SECTION, Betty's Towne House, Agawam, Mass.

October 18-20—PACIFIC NORTHWEST SECTION, Boise Hotel, Boise, Idaho.

October 20-21—PENNSYLVANIA SECTION, Pennsylvania State University, University Park.

October 20-21—VIRGINIA SECTION, Virginia Polytechnic Institute, Blacksburg, Va.

October 28—MICHIGAN SECTION, Michigan State University, East Lansing.

October 30—BATON ROUGE SECTION, Agricultural Engineering Auditorium, Louisiana State University, Baton Rouge, La.

November 3—CENTRAL ILLINOIS SECTION, Illinois Agricultural Association Bldg., Bloomington, Ill.

November 17—QUAD CITY SECTION, American Legion Hall, Moline, Ill.

November 24-25—MISSISSIPPI SECTION, Mississippi State University, State College, Miss.

December 12-15—WINTER MEETING, Palmer House, Chicago, Ill.

June 17-20—ANNUAL MEETING, Mayflower Hotel, Washington, D. C.

**NOTE:** Information on the above meetings, including copies of programs, etc., will be sent on request to ASAE, St. Joseph, Mich.

Friday evening banquet. Following the business meeting on Saturday, section members will attend the Roanoke Harvest Festival football game between VPI and the University of Virginia.

### Ohio Section

The fall meeting of the Ohio Section was held on October 6 and 7 at the Olentangy Inn, Columbus, Ohio. The two-day meeting opened on Friday with a luncheon, which was followed by a technical program and business meeting. The technical program included discussions on buildings for profitable farmsteads, by D. W. Richter, Armo Drainage and Metal Products, Inc.; reinforced fiberglass products for farm use, by Fred Dover, Industrial Products Division, General Tire and Rubber Co.; and the "6000" Ford, by E. S. Judy, Ohio Tractor and Implement Co. A banquet in the evening completed the Friday program.

The concluding session on Saturday morning was devoted to the presentation of papers by the following members of the Ohio Agricultural Experiment Station staff at Wooster: E. W. Klosterman, animal science, on beef performance as corn con-

(Continued on page 564)



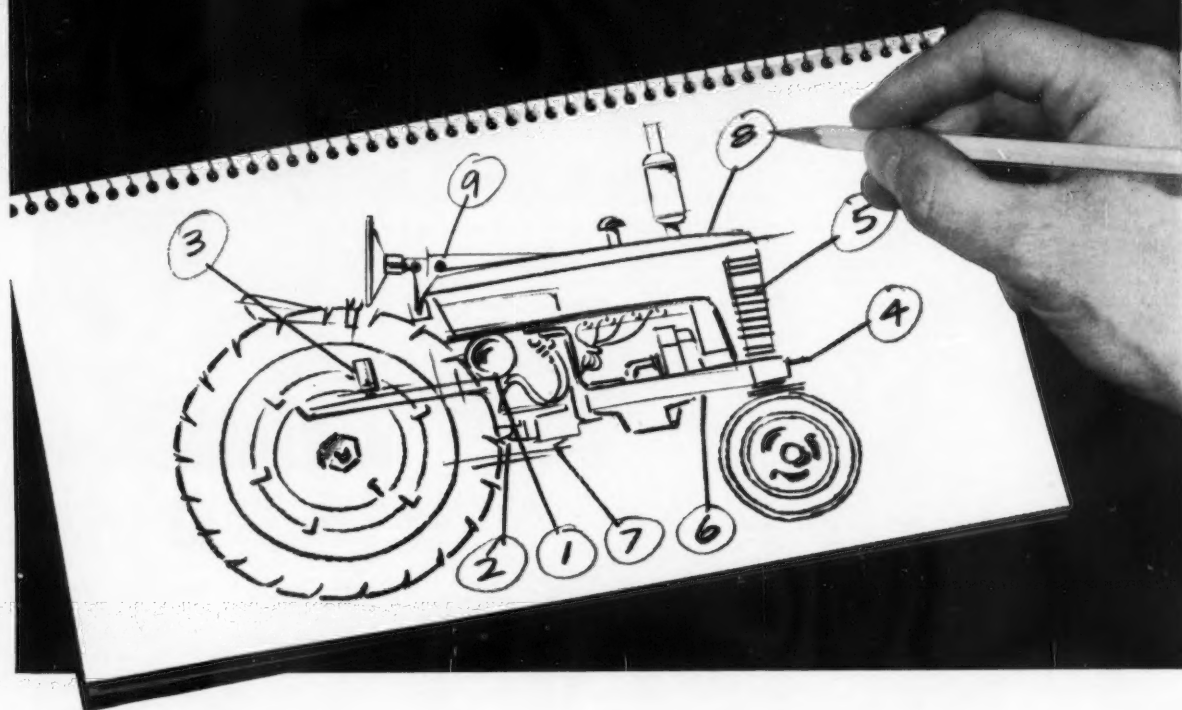
Shown left to right are ASAE President and Mrs. Byron T. Virtue, retiring North Atlantic Section Chairman and Mrs. Nevin T. Brenner, Local Arrangements Chairman and Mrs. J. Arnold Roberts, and ASAE Treasurer and Mrs. Ralph A. Palmer, as they posed for the camera following the North Atlantic Section annual dinner, Tuesday evening, August 22, in the Beaverbrook Gymnasium



(Left) North Atlantic Section members and guests patronize the lobster industry at a picnic type outing at the Lady Beaverbrook Rink Monday evening, August 21, on the University of New Brunswick campus. (Right) An exhibit, prepared by R. E. Wallin, chairman of the North Atlantic Section Committee on Student Paper Awards, emphasizes interest of the Section in student paper competition. The Section sponsors a competition in its area, and some of its students frequently stand high in the national competition



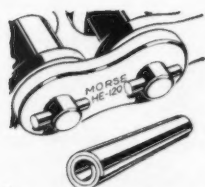
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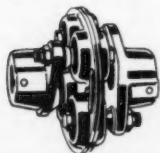
**1** Taper-lock sprockets on side power-take-off shaft



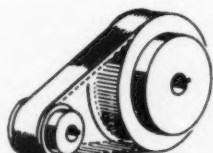
**2** H-E Roller Chain for power transmission



**3** Morse torque limiter on power-take-off shaft



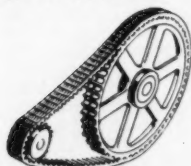
**4** Morflex coupling on front-end drive shaft take-off



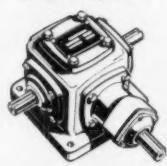
**5** Timing® Belt drives for fuel injection application



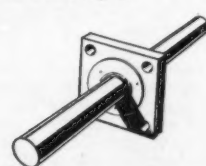
**6** Morse silent Timing Chains for tractor engines



**7** Hy-Vo® Drives for drop-box transmission



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**9** Two-Way, No-Way Clutch for hand throttles

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# MORSE

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## ... With ASAE Sections

(Continued from page 362)

centration of silage varies; R. B. Curry, agricultural engineer, on applications of results on flow of colloidal suspensions through porous media; W. H. Johnson, agricultural engineer, on soil separation—a tillage method; and G. B. Triplett, agronomist, on no tillage for corn (response of corn under chemical weed control and no tillage).

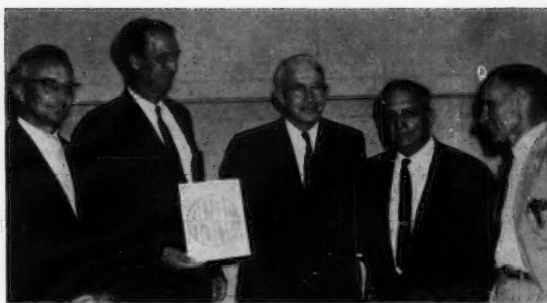
### Pacific Northwest Section

Governors from two states will speak during the annual meeting of the Pacific Northwest Section to be held on October 18 to 21 at the Hotel Boise, Boise, Idaho. Registration will begin at 5:00 p.m. on Wednesday, followed by a program and social hour. The program will consist of two films, entitled "Idaho High Country" and "Glimpses of Japan."

A student business breakfast will start the Thursday morning activities, followed by a general program. E. W. Shellworth, mayor of Boise, will give the welcoming address, after which the Honorable George D. Clyde, governor of the state of Utah, will address the group on the topic "Water Resource Development and Management." The following topics also will be discussed: The Role of Product and Market Research in Agricultural Equipment; Economic Research Studies on Pelletized Feed for Modern Meat; and Component Construction in Farm Structures. National President B. T. Virtue (consultant, Bearings Division, The Torrington Co.) will be the luncheon speaker on the subject "ASAE Headquarters Personnel and Functions." The Thursday afternoon session will be devoted to the presentation of the Student Award papers and the annual business meeting. The speaker at the annual banquet on Thursday evening will be the Honorable Robert E. Smylie, governor of the state of Idaho.

W. N. Pauley, manager, H. E. Bovey, Jr., Consulting Engineers, will open the general program on Friday morning, when he speaks on professionalism in engineering. He will be followed by C. F. MacGowan, director, Office of Saline Water, USDI, who will speak on saline water conversion. Three concurrent programs also will be presented on Friday morning. On a joint Electric Power and Processing-Farm Structures program, the following papers will be presented: "Air Supported Greenhouses"; "Effects of Various Day Lengths on Egg Production"; and "Effect of Cathode Ray Radiation on Storage Properties of Wheat." The following subjects will be discussed on a Soil and Water program: "Control of the Okanogan River Floods in British Columbia"; "Some New Concepts of Consumptive Use from Laboratory Experiments"; "Use of Electric Data Processing Equipment in Water Supply Forecasting and Management"; and "Optimum Sprinkler Irrigation Rates on Soils of Low Infiltration Rates." On a Power and Machinery program, papers will be presented on a new approach in crawler tractor design; field hay wafering; and separation of seed by vibration. The speaker at the Friday noon luncheon will be A. C. Johnson, manager, Idaho Operations Office, U. S. Atomic Energy Commission, who will talk on agricultural applications of atomic energy.

Friday afternoon will be devoted to a tour of Boise Valley industries. A student dinner on Friday evening will be complementary to students and faculty advisors of ASAE student branches, through the courtesy of R. M. Wade & Co., Portland, Ore. The banquet speaker will be J. E. Morriison, western regional sales manager, R. M.



(Above) R. L. Green, chairman of the Washington, D.C.-Maryland Section of ASAE, displays a new ASAE emblem during the Section meeting Friday, September 8. The new emblem will be used on markers to guide members during the 1962 ASAE Annual Meeting of which the Washington, D.C.-Maryland Section will serve as host. Left to right are J. L. Butt, ASAE executive secretary; Green; B. T. Virtue, ASAE president; E. G. McKibben, chairman, Local Arrangements Committee for the Annual Meeting; and W. M. Carleton, chairman, Meetings Committee for Annual Meeting



(Below) Iowa Section elected new officers during its August 29 meeting. Shown left to right are L. F. Charity, retiring chairman; R. H. Meier, chairman; and W. G. Lovely, first vice-chairman

Wade & Co. A special dinner for the outgoing and incoming Executive Committee is also scheduled for Friday evening. Four concurrent technical sessions also will be held on Friday evening. Papers covering the following subjects will be presented at an Electric Power and Processing program: Applications of solar collectors to hay and corn drying; and processing the Idaho potato. Papers on the effect of some wood preservatives on lumber expansion; an automatic above-ground potato storage building for the farm; and development of a plywood rigid frame system for farm buildings will be presented during a Farm Structures program. On a Power and Machinery program, measuring the effect of crop rotation on soil structure; potato harvesting equipment; and mechanical harvesting of thornless evergreen blackberries will be discussed. A Soil and Water program will include presentations on the following topics: "Sprinkler Irrigation Mechanization for the Future"; "Geology as It Affects Drainage of Irrigated Lands"; "Automation of Surface Irrigation Systems"; "Water Pollution and Its Control"; and "Electric Analog Studies of Unsaturated Flow from Irrigation Furrows."

The three-day meeting will be concluded on Saturday morning with a tour of Hell's Canyon area, as well as Brownlee and Oxbow Dams. An interesting program also has been arranged for the ladies.

### Arizona Chapter, Pacific Coast Section

The Arizona Chapter of the Pacific Coast Section held a dinner meeting on October 6 at the Sands of Tempe Motor Motel, Tempe, Ariz. The featured speaker of the evening was Clifford A. Pugh, head of the Phoenix office of the Bureau of Reclamation, who spoke on water in Arizona and the central Arizona project.

### Mississippi Section

The Mississippi Section will hold its annual meeting on November 24 and 25 at Mississippi State University. The tentative program will include a football game, coffee hour, and banquet on November 24. Tentative banquet speakers will be W. L. Giles and H. C. Simrall, vice-president for agriculture and forestry, and dean of engineering, Mississippi State University, respec-

tively. Tentatively scheduled for the morning of November 25 are a tour of the engineering facilities on campus and a technical meeting.

### Washington, D.C.-Maryland Section

The Washington, D. C.-Maryland Section will hold a meeting on October 13 at the USDA South Building in Washington, D. C. Dr. Hans Sack, director, Institute for Agricultural Engineering, Technical University of Aachen, Germany, who is visiting in the United States, will be the guest speaker. His topic will be "Agricultural Engineering in Germany."

During the September meeting, announcement was made of the appointment of Hajime Ota and F. V. Matthews, Jr. (delegates) and G. C. Winter and R. L. Green (alternates) as section representatives to the D. C. Council of Engineering and Architectural Societies for the 1961-62 season.

### Connecticut Valley Section

A Connecticut Valley Section meeting will be held on October 18 at Betty's Towne House, Agawam, Mass. This will be a 7:00 p.m. dinner meeting at which officers for the ensuing year will be elected. Raymond Varanka, home heating specialist for Western Massachusetts Electric Co., will be the main speaker of the evening, addressing the group on the topic "Home Heating Progress."

### Iowa Section

The Iowa Section held a short business meeting on August 29 at the John Deere Des Moines Works, at which the following slate of officers was elected for 1961-62: R. H. Meier, chairman; W. G. Lovely, first vice-chairman; J. J. Hennen, second vice-chairman; R. L. Phillips, third vice-chairman; and R. B. Hopkins, secretary-treasurer. The next meeting will be held on November 3 — the location and program to be announced at a later date.

### Central Illinois Section

The Central Illinois Section will hold a meeting on November 3 in the Illinois Agricultural Association Building at Bloomington, Ill. Prior to the technical session a tour will be made of the IAA building. Included on the program will be papers on scale model studies in soils, by G. T. Corhan, research engineer, Caterpillar Tractor Co.; and on research development in rigid

frame buildings, by J. O. Curtis, associate professor, and E. D. Rodda, research associate, agricultural engineering department, University of Illinois. A 6:30 p.m. dinner will be served at which Bill Allen, public relations department, Illinois Agricultural Association, will speak on the role of agricultural industry in agricultural public relations.

#### Quad City Section

The Quad City Section will hold a dinner meeting on November 17 at the American Legion Hall, Moline, Ill. The after dinner program will include an address by National ASAE President Byron T. Virtue, consultant, Bearings Division, Torrington Co., Torrington, Conn., and a presentation by W. J. Mumm of Crow's Hybrid Corn Co., Milford, Ill., who will speak on teosinte cross multiple eared corn and its possible effect on corn harvesting.

#### Pennsylvania Section

The fall meeting of the Pennsylvania Section will be held October 20 and 21 in the Hetzel Union Building of Pennsylvania State University. A noon luncheon will be served after which the following papers will be presented: "Moisture Control in Building Construction"; "Agricultural Engineering Curriculum—A Review of Enrollment Questions"; "A Mechanized Agriculture Program of Studies for Penn State"; "Old Frontiers for Modern Agriculture"; "Treatment of Individual Water Supplies"; "Hydrological Studies Related to Pennsylvania Needs"; and "Problems of Large Pennsylvania Dairy Farmers." During the business meeting, which will conclude the afternoon program, new section officers for 1961-62 will be elected. A 6:30 banquet will be served in the Penn State Room of Nittany Lion Inn. The featured banquet speaker will be R. C. Dawson, technical officer, Food and Agriculture Organization of the United Nations, who will address the group on the topic "The Role of Agricultural Engineers in Technical Aid to Underdeveloped Areas."

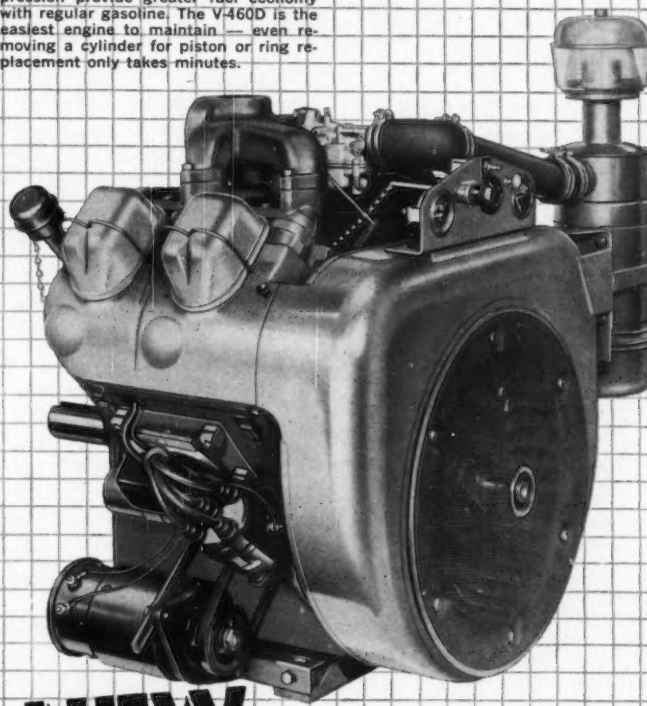
The Saturday morning session will open with the showing of a movie entitled "Fall-out and Agriculture." Papers also will be presented on labor comparisons for conventional and random-bale hay handling; engineering approach to the design of new equipment; and Pennsylvania "agindustrial" adjustment. The group will attend the Pennsylvania State-Syracuse football game on Saturday afternoon.

#### Michigan Section

The Michigan Section will hold its fall meeting October 28 in the Agricultural Engineering Building at Michigan State University. A new format will be used—a combination speaker-workshop meeting. As the lead speaker, J. L. Butler will discuss problems in wafering non-legume forages. The remainder of the morning will be used to examine the question, "Where Should We Be Going in Agricultural Engineering Education?" J. D. Ryder, dean, College of Engineering, Michigan State University, will discuss education; R. L. Erwin, acting manager of engineering, Tractor and Implement Division, Ford Motor Co., will cover industry; and R. E. Stewart, chairman, agricultural engineering department, Ohio State University, will talk on research. Those in attendance will be divided into small groups to discuss the problem and possible courses of action which would lead to better educated agricultural engineers. A luncheon will be served at noon in the South Campus Grill, after which the group will attend the Michigan State-Indiana football game.

The annual meeting of the Section will be held on April 14 in Detroit, Mich.

**VALVE-IN-HEAD DESIGN**, and 7:1:1 compression provide greater fuel economy with regular gasoline. The V-460D is the easiest engine to maintain—even removing a cylinder for piston or ring replacement only takes minutes.



**NEW  
60 HP. WISCONSIN**

*keeps your equipment on the job  
—and out of the repair shop*

You can't find a source of power that is better protected than the new V-460D valve-in-head Wisconsin. It's designed to keep your equipment working and your customers satisfied.

Improved cooling assures dependable power at extreme temperatures. The center main roller bearing and tapered roller main end bearings supporting the forged-steel crankshaft make bearing failure almost unheard of.

Stellite-faced exhaust valves and positive rotators spare users the cost of up to four ordinary valve jobs. Controlled pressurized lubrication maintains full-time oiling to all working parts. A plastic pre-cleaner and an oil-bath air cleaner keep dirt out of the engine.

The V-460D has automatic protection against overheating and negligence of routine engine care. Snap-off cylinder-head covers guard the cooling fins and spark plugs against damage, dirt, and condensation build-up.

These and other features protect users of your equipment against costly power failure. Make sure by powering it with the best-protected engine made—the new 60-hp air-cooled V-460D Wisconsin. Send for Bulletin S-282. Write to Dept. O-41.



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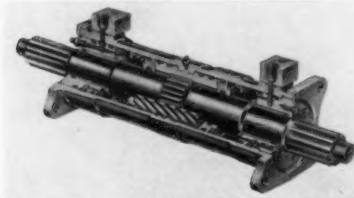
*World's Largest Builders of Heavy-Duty Air-Cooled Engines*

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### Hydraulic Rotary Torque Actuators

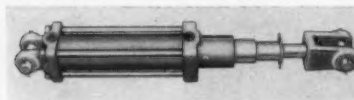
Menasco Mfg. Co., Burbank, Calif., has announced new rotary actuators for converting hydraulic pressure into mechanical



torque. The new units offer angular rotation to 200 deg, with controlled deceleration at the limits of rotation. The torque reportedly remains constant regardless of the shaft angular position. They operate on pressures up to 5,000 psi. Rotary torque output ranging from zero to 500,000 in.-lb is said not to be affected significantly by temperature variations from -65 to 165 F.

### New Hydraulic Cylinder

Prince Manufacturing Corp., Sioux City, Iowa, has announced production of a new hydraulic cylinder suitable especially for use



with high pressure systems of several makes of farm tractors. The new cylinder features adjustable stroke control of the positive mechanical type and meets ASAE specifications for operating up to 4000 psi.

### SP Forage Harvester

New Holland Machine Co., New Holland, Pa., has announced its first self-propelled forage harvester called the Crop-

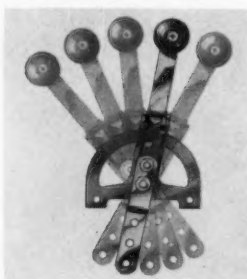


Cruiser. Features include a 130-sq-in. throat, 130-hp engine and an advanced speed control system. According to company engineers, design emphasis has been placed on compactness, maneuverability, efficiency of operation, comfort to the operator, flotation, visibility, safety, capacity, and quality of silage.

Ground speed varies from 1 to 18 mph by use of a three-speed and reverse Rockwell Standard gearbox that works with a variable speed sheave. Variations in speed are made without changing the throttle setting. The engine runs at its governed speed, providing constant peak horsepower without regard to ground speed.

### New Positioning Control

Adams Rite Mfg. Co., 540 W. Chevy Chase Dr., Glendale, Calif., has announced a new positive-positioning quadrant control



mechanism, for use as a manually operated throttle control or for other motion control applications on farm machinery. The new control has an automatic, self-locking feature which permits infinitely-variable positioning of the control handle. The primary handle of the unit may be advanced or retarded to any desired position with one simple movement. The mechanism automatically locks itself in position wherever the handle is stopped; it automatically unlocks itself whenever the handle is moved again. Further information may be obtained by writing the manufacturer and asking for Bulletin 3400-9-60.

### New Flail-Type Spreader

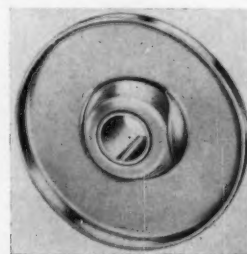
New Idea Farm Equipment Co., Coldwater, Ohio, has added a 160-bu flail-type spreader to its line. The flail mechanism



consists of a single undershot cylinder, which carries 16 free swinging, weighted, heat-treated, sharpened flails. According to the manufacturer, the flails shread and spread manure from frozen chunks of dairy manure to sloppy feedlot manure in sub-zero weather without build-up. Power is transmitted to the cylinder through an oil filled bevel gear box and roller chain drive. An adjustable spring-type slip clutch protects the drive line from shock loads.

### Bearing for Belt-Type Conveyors

Triangle Manufacturing Co., Oshkosh, Wis., has introduced a new conveyor bearing with one-piece mounting. In the initial



application for a conveyor belt a permanently lubricated ball unit was used containing a large reservoir of lubricant. Depending upon loads and speeds involved, similar

bearings can be supplied for either oil or grease lubrication as well as permanently lubricated. Shaft sizes range from 1/4 to 1/2 in.

### New Hydrostatic Transmission

Watertown Division, The New York Air Brake Co., Starbuck Ave., Watertown, N. Y., has introduced a new hydrostatic



transmission for mobile equipment. In its simplest form such as for use in a fork lift truck, the new transmission, called Dynapower, consists of a variable displacement axial piston hydraulic pump which is coupled directly to the vehicle's engine, and a fixed-displacement hydraulic motor which drives directly into the differential. High pressure hoses replace the conventional drive shaft, universals, gear changers and clutches. The speed and direction of rotation of the hydraulic motor are determined by the position of the pump's variable cam.

Other combinations of single and dual, fixed and variable pumps and motors are available for applications having different performance requirements. An important feature of the new transmission is its ability to produce full torque at low engine speeds. Reversing vehicle direction reportedly is done with a high degree of smoothness, at any rate of change desired, and without brakes or clutches. Present production models have been designed for installation as the traction drive for lift trucks, front end loaders, farm tractors, combines, and other similar off-road vehicles. Installations other than traction drives include power steering for heavy road scrapers, drum drives for mobile concrete mixers, and variable speed drives for cooling.

### Rectangular Air Cleaner

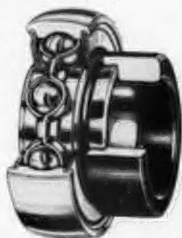
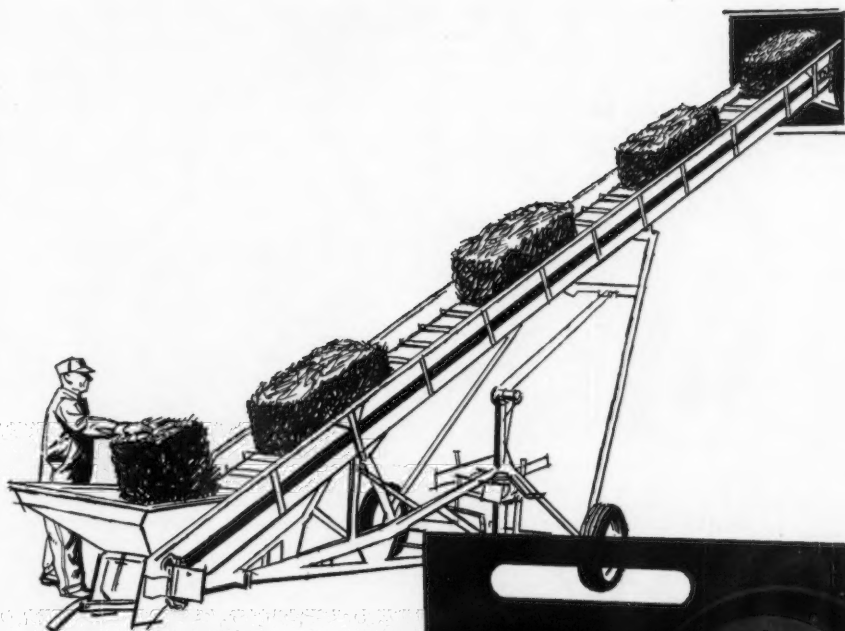
Farr Co., P.O. Box 90187, Airport Station, Los Angeles 45, Calif., has introduced a new single-stage, dry-type, engine air



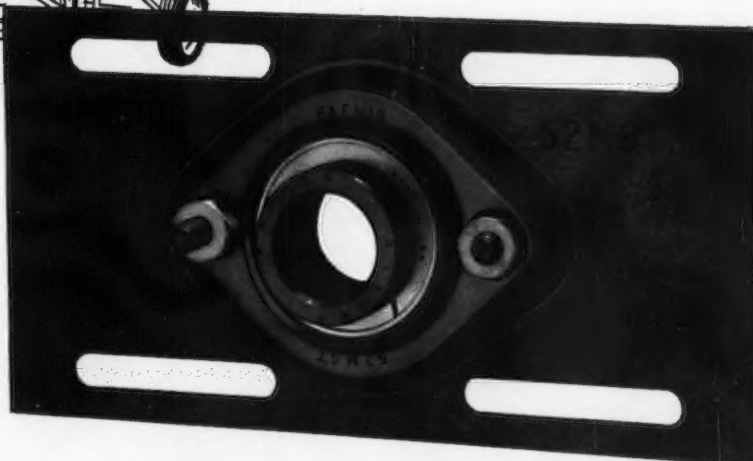
cleaner now available in 12 standard sizes. The cleaner assembly consists of a rectangular housing and a new modular type filter cartridge. According to the manufacturer, the new shape provides maximum dirt holding capacity for its size and a low pressure loss for the air intake system.

The face plate of the disposable cartridge is a rubber-like plastic (polyvinyl chloride) into which the filter paper is molded. The face plate forms an integral air seal when locked in place in the housing.

(Continued on page 568)



Fafnir Extended Inner Ring Ball Bearings with Plya-Seals and Self-Locking Collar.



# FAFNIR

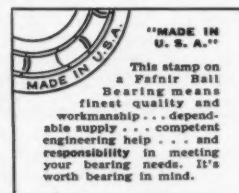
## PRESSED STEEL TAKE-UP UNIT

This light-but-rugged, compact, ready-to-mount "package" offers down-the-line savings to manufacturers who have been making their own take-ups for light-duty installations. It can also be used in place of heavier, more costly types where excessive weight and capacity are not needed. Available in two basic sizes covering eight different shaft dimensions, the unit is adaptable to either guide-type or bolt-type methods of mounting and can accommodate misalignment without adjustment.

The sealed and permanently prelubricated Fafnir ball bearing needs no in-service attention. It has "built-in" self-alignment to compensate for differences in take-up on either side of a shaft. The bearing is equipped with the Fafnir-originated self-

locking collar, incorporating the eccentric cam principle that simplifies installation to a twist of the wrist. No machining of shaft shoulders is needed . . . no mounting devices.

For complete information on how this cost-cutting Fafnir take-up unit can be adapted to your requirements, contact your Fafnir representative. Or write The Fafnir Bearing Company, New Britain, Conn.



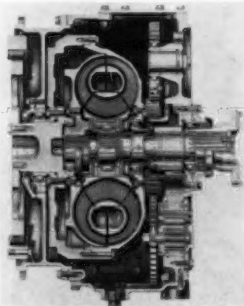
**FAFNIR**  
BALL BEARINGS

## ... New Products

(Continued from page 566)

### New Line of Torque Converters

Rockford Clutch Div., Borg-Warner Corp., Rockford, Ill., has announced a new line of torque converters specially designed



to provide an infinite number of torque-speed ratios for off-highway vehicles, wheel and track-laying tractors, loader graders, rollers, stationary power units and industrial drives. Designed for loads from 100 to 700 hp, the new torque converters have torque multiplication ratios from 2.3:1 to 3.5:1. Sizes range up to 18½ in. diameter. Units are single stage, 3-element type with or without automatic over-running reaction members for fluid coupling operation. Rotating and stationary housing models are available. Also, drive can be direct spline to flywheel or flexible rubber-drive coupling.

### Announces SP Swather

Oliver Corp., 400 W. Madison St., Chicago 6, Ill., has introduced its new self-propelled Model 86 swather with new



double-gear drive system and table design for harvesting hay, grain, alfalfa, and other grassland crops. The new swather is designed with 6-batt, cam-type reel in 10, 12, 14, and 16-ft widths. Power is supplied by a Wisconsin VH4D engine coupled with a new dual-gear planetary-drive system. The table design has hydraulic features that are said to enable knives to float over uneven, corrugated terrain while maintaining constant cutting height, with no digging in. Table may be raised to pass over an obstacle, then set back down at the predetermined cutting height, from 2 to 30 in.

The swather frame and power unit convert to a field sprayer with 180-gal tank capacity for weed and insect spraying. Sprayer assembly includes pump capacities up to 200 psi pressure, 42-ft boom width with 12-ft spray extension available.

### New Seal Development

Rocketdyne, a Division of North American Aviation, Inc., 6633 Canoga Ave., Canoga Park, Calif., has announced that Naflex, a cryogenic metal seal used in rocket engines, is now on the market as an "off the shelf" item. Main feature of the new seal is said to be its ability to seal through high and low extremes of pressure at low bolt and flange loads. Also, the seal is said

to be repeatedly re-usable. Standard seals in aluminum with Teflon covered sealing points are available in sizes ranging from one to 20 in.

### Upset Forging Advanced

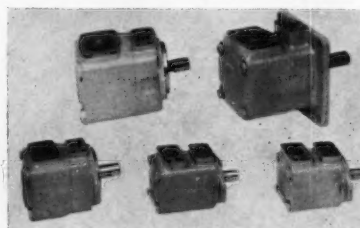
Commercial Shearing and Stamping Co., Youngstown, Ohio, has announced production of upset-forged agricultural equipment



component parts previously considered unsuitable for production by upset forging. Shown is a dovetail groove steering link pedestal for fast front-end changeover in an all-purpose farm tractor. Company engineers found that through precision production on a 6-in. upsetter they could produce such an unusual shaped part as an upset forging and still hold to the close tolerances. As a result the part reportedly is produced at savings both in machining time and in metal.

### Increases Vane Type Pump Line

Vickers Inc., Division of Sperry Rand Corp., Detroit 32, Mich., has announced that three series of vane type mobile pumps



have increased outputs, and that two completely new series have been added to the line. Advanced design features in the increased displacement pumps permit normal operation at speeds up to 2700 rpm and pressures up to 2500 psi. Although the new designs are slightly longer than earlier models, the package-size-to-horsepower-ratio is said to be decreased. Capacities range from 12 to 109 gpm at 1200 rpm and 100 psi.

### New Driers Announced

Deere & Co., 3300 River Dr., Moline, Ill., has announced a new portable Model 98 crop drier which can be adjusted to han-



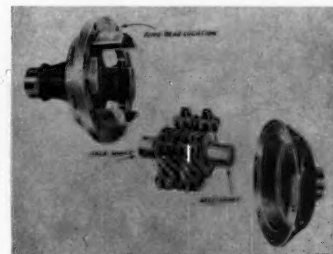
dle a wide range of drying jobs. The new unit is said to provide an air-delivery range of 5,000 to 22,000 cfm. Rate is adjusted by changing pitch of fan blades. The new drier

can be operated either on the transport chassis or mounted on a fixed base.

Also announced is the Model 550 drier with a capacity of 550 bu. This unit is equipped with new metering rolls that minimize grain damage and speed unloading.

### Gear Drive Differential

Dual Drive, Inc., 3597 Lee Rd., Cleveland 20, Ohio, has designed a new differential consisting of two basic operating parts



— a balancing gear and a side gear. The entire unit is said to be interchangeable with a standard gear carrier. In operation, worms on axle shaft mesh with worm wheels. The worm wheels are interconnected by balancing gears for power division on turns without the tendency to push a vehicle straight ahead. The new differential is a true gear differential. A system of gears, acting as driving keys, is said to transmit engine power to the rear wheels in exact ratio to the traction resistance of the wheels when the vehicle is in either forward or reverse motion.

### New Flow Divider Valve

Hydraulic Electronic Division, Fawick Corp., 9919 Clinton Rd., Cleveland 11, Ohio, has announced an adjustable flow divider valve, with lever operated flow control, designed to simplify control of hydraulic systems requiring a variable rate of fluid flow from one fixed displacement pump. Also, the new valve facilitates attachment of tractors to implements having hydraulic systems of different capacities.



Locked stops provide 10 calibrated rates up to 60 gpm in addition to the shut-off position. The divider allows fluid in excess of the amount delivered to its priority port to be used to operate another completely independent system at high or low pressure with no effect on the controlled system. It also can be linked with additional units in series or parallel circuits to operate multiple motors and actuators in the same system from one pump.

### Creates New Alloy

Clinton Engines Corp., 250 Park Ave., New York 17, N. Y., has announced the development of a new alloy, to be known as Alumatloy, which is said to alleviate almost entirely any problems of porosity. According to the manufacturer, the new metal acquires its high density and, therefore, low

(Continued on page 575)

## MANUFACTURERS' LITERATURE

Literature listed below may be obtained by writing the manufacturer.

### Bearing Terms Booklet

**SKF Industries, Inc.**, Front St. and Erie Ave., Philadelphia 32, Pa.—A 24-page booklet (Form No. 343) entitled "Bearing Parts and Nomenclature of Standard and Precision Bearings" defines and illustrates ball and roller bearing parts and terms. Other subjects included are ball installation, dimensions, loads, alignment, types and functions of self-aligning, nonself-aligning, and thrust bearings. Bearing accessories such as shields, seals, snap rings, seats, and housings are also described.

### Backhoes Bulletin

**The Parsons Company**, P.O. Box 431, Newton, Iowa—A 4-page, 2-color bulletin (PS-828) describes and illustrates four backhoes ranging from 10 ft to 15 ft digging capacity. Specifications are also included as are picture-stories of other equipment—hydroclam, rear blades, and front end loaders.

### Pin-Type Fasteners

**Driv-Lok Sales Corp.**, 777 Park Ave., Sycamore, Ill.—A 4-page data file describes the standard line of solid grooved pin fasteners, as well as studs, dowels, and high-alloy shear-proof pins. It lists recommended pin diameters for various shaft sizes and torque values transmitted by pins in double shear; minimum single shear values are also listed in a separate table for pins of various metals. Available finishes, dimensions and tolerances are also given.

### Hydraulic and Pneumatic Packings

**Chicago-Allis Mfg. Corp.**, 125 N. Green St., Chicago 7, Ill.—A 16-page catalog, Bulletin No. 341, illustrates and describes complete line of pneumatic and hydraulic packings, including cup, flange, "U", Vee, "O" rings, back-up washers, one-piece double-acting piston cups, and double-lip shaft wiper seals. Also included is information on various materials, conditions of operation, typical design application, specifications, and data charts on packings in standard sizes. It also serves as a design handbook and guide.

### Valve Remote Control Systems

**Stow Manufacturing Co.**, 39 Shear St., Binghamton, N. Y.—Bulletin No. 618 is a 20-page, 2-color design manual covering complete line of manual remote controls as used on ships and in power plants, chemical plants, nuclear power plants and industrial plants for valves. It is divided into three sections: (1) Flexible shafting; (2) standard rigid reach rod controls; and (3) gear boxes. Also included are dimensional sketches of all terminals.

### Two-Row Corn Head

**Allis-Chalmers Manufacturing Co., Farm Equipment Division**, Milwaukee 1, Wis.—A two-page, two-color bulletin (No. TL-2443) describes and illustrates two-row corn head for Model A Gleaner combine. Included are specifications.

### Portable Soil Tester

**Industrial Instruments, Inc.**, 89 Commerce Rd., Cedar Grove, N. J.—A brochure describes and illustrates the RD-B15 portable soil tester, for use in measuring total soluble salt in greenhouse and nursery soils. Also described is a kit, designated Kit RD-300S, containing the soil tester, a dip cell, thermometer, measuring flasks and a hardwood carrying case.

### Two-Way Radio Transceiver

**E. F. Johnson Co.**, Waseca, Minn.—A two-page, two-color circular describes and illustrates the "Personal Messenger" two-way radio transceiver. Included are its qualifications, flexibility, and uses, as well as a battery chart and a listing of accessories.

### Grease Summary

**Bardahl Manufacturing Corp.**, 1400 N.W. 52nd St., Seattle 7, Wash.—A 32-page booklet entitled "Grease" is a review of grease lubrication, including the basic principles, types and rules for choice and application of lubricating grease, as well as the effect of additives on the properties of grease.

### Undercarriage Parts for Older Tractors

**Caterpillar Tractor Co.**, Peoria, Ill.—An 8-page booklet entitled "Users Report Big Savings" (Form DE121) includes six reports from machine owners on how they have used and profited from large size op-

tional track parts and lifetime lubricated rollers for their older tractors.

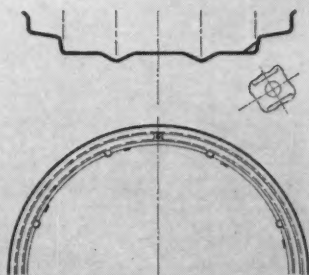
### Earthmoving Wheel Tractors

**Construction Machinery Division, Clark Equipment Co.**, Benton Harbor, Mich.—Paper entitled "Michigan Wheel Tractors in Earthmoving" presented by R. J. Warren, product specialist, Clark Equipment Co., as part of a Symposium on Highway Equipment at the 59th Annual Convention of the American Road Builders Association, March 1961.

### Variable Speed Belts

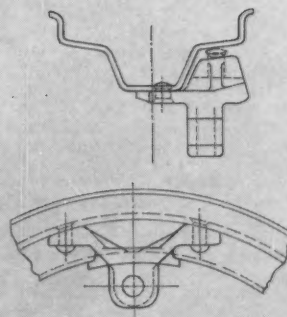
**T. B. Wood's Sons Co.**, Chambersburg, Pa.—A 20-page bulletin, No. 24103 contains five tables with the following headings: (1) Alphabetical Listing of Applications; (2) Numerical Listing of Manufacturer's Part Numbers; (3) Numerical Listing (according to size); (4) Variable Speed Cross Reference; and (5) Wood's Variable Speed Belt Cross Reference.

## Now available from Motor Wheel



### DOUBLE-BEVELED RIMS

Double-beveled rims for adjustable tractor and implement wheels are now available from Motor Wheel. Combine with loose clamps and our standard discs. If you have a requirement for double-beveled rims, write for complete specification data.



### RIM-AND-CLAMP ASSEMBLIES

Our standard rims for tractors and implements are now available with welded or riveted clamp assemblies. Combined with Motor Wheel's standard discs, these new assemblies (all popular clamp designs available) provide low-cost adjustable wheels. Write for data.

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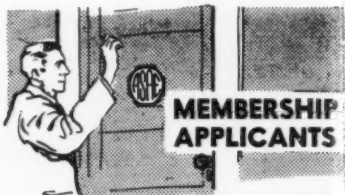
The addition of double-beveled rims and rim-and-clamp assemblies to our line of agricultural-wheel equipment is another example of why Motor Wheel is the one source for your every wheel requirement. With over 500 different "Application Engineered" wheels and continuous broadening and improvement of our line, we offer the most complete line of wheels specifically engineered to meet the exacting needs of farm machinery.

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The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

- Buck, Samuel E.**—Serv. mgr., Oliver Corp. (Mail) 1515 E. Altgeld, South Bend 19, Ind.
- Elwick, Keith D.**—Vice-pres., Hawk Bilt Mfg. Corp., Vinton, Iowa
- Everts, Albert E.**—Engr. spec., (SCS) USDA. (Mail) 1910 Vista St., Boise, Idaho
- Gloin, Beverley G.**—Field rep., Plywood Manufacturers Association of British Columbia, 383 Richmond St., Room 107, London, Ont., Canada
- Hanon, Mario J.**—Jr. engr., California State Polytechnic College. (Mail) Nandaime, Nicaragua, C.A.
- Hubbard, James M.**—Farm advisor, Farmers Rural Electric Co-op. Corp. (Mail) 226 Kelly Dr., Glasgow, Ky.
- Reed, Marion J.**—Asst. agr. engr., University of Georgia, Barrow Hall, Athens, Ga.
- Richards, Ernest**—Agr. engr., (SCS) USDA. (Mail) 318 E. Sixth St., Lordsburg, N. M.
- Scott, Swayne F.**—Agr. engr., (SCS) USDA. (Mail) P.O. Box 1133, Dalhart, Texas
- Smith, Herschel A.**—R.R. 2, Presque Isle, Maine
- Squires, William E.**—Territory mgr., Oliver Corp. (Mail) 1799 Rosswood Dr., San Jose 24, Calif.
- Stewart, Larry E.**—Ext. instr., agr. eng. dept., University of Maryland, College Park, Md.
- Symes, Richard T.**—Proj. engr., J & L Engineering Co. (Mail) 311 Minville Blvd., Jeanerette, La.
- Tullis, Harry E.**—Forest engr., U.S. Forest Service, USDA. (Mail) 765 Belgrave Ave., Reno, Nev.
- Veech, Everett R.**—Asst. engr., Allis-Chalmers Mfg. Co. (Mail) 415 Greenleaf St., LaPorte, Ind.
- von Engelbrechten, Jan**—Field engr., Sunspiced Vegetables, Inc., P.O. Box 903, King City, Calif.

#### TRANSFER OF MEMBERSHIP

- Mutchler, Calvin K.**—Agr. engr., (SWCRD, ARS) USDA. (Mail) 7 Brook St., Morris, Minn. (Associate Member to Member)
- Sack, Hans A.**—Engr., John Deere Tractor Res. and Eng. Center. (Mail) 1923 Maplewood Dr., Cedar Falls, Iowa (Associate Member to Member)
- Wang, Jaw-kai**—Asst. prof. and acting chm., agr. eng. dept., University of Hawaii, Honolulu 14, Hawaii (Associate Member to Member)

#### STUDENT MEMBER TRANSFERS

- Birewar, Bhaya R.**—(Kansas State University) Lecturer in agr. eng., College of Agriculture, Osmania Univ., Hyderabad, India
- Bortner, Edward J.**—(Pennsylvania State University) R.R. 3, Hanover, Pa.
- Carpenter, Philip C.**—(Purdue University) R.R. 1, Butler, Ind.
- Carson, William D.**—(Virginia Polytechnic Institute) Virginia Electric & Power Co., Richmond, Va.
- Crum, John E.**—(Purdue University) Humphrey, Ark.
- Doss, David R.**—(Auburn University) R.R. 2, Box 48, Adamsville, Ala.
- Farnham, Charles W.**—(Iowa State University) 3641 7th Ave., Council Bluffs, Ia.

## PERSONNEL SERVICE BULLETIN

Note: In this bulletin the following listings current and previously reported are not repeated in detail. For further information, see the issue of AGRICULTURAL ENGINEERING indicated. "Agricultural Engineer" as used in these listings is not intended to imply any specific level of proficiency or registration as a professional engineer. Items published herein are summaries of mimeographed listings carried in the Personnel Service, copies of which will be furnished on request. To be listed in this bulletin, request form for Personnel Service listing.

**Positions Open — April** — O-95-117, 163-119.  
**May** — O-198-121, 199-122, 212-123, 218-124, 226-125.  
**June** — O-257-126, 257-127, 265-128, 259-129.  
**July** — O-284-130, 286-131, 293-132, 294-133, 294-134.  
**August** — O-310-136, 329-137, 334-138, 337-139, 341-140.  
**September** — O-350-141, 311-142, 371-143.

**Positions Wanted — April** — W-112-17, 135-18, 142-19, 115-20, 160-21, 161-22, 164-24, 166-26, 171-27, 178-28.  
**May** — W-190-30, 97-31, 200-32, 201-33, 202-34, 203-35, 204-36.  
**June** — W-244-37, 264-39.  
**July** — W-228-41, 213-42, 285-44, 280-45, 290-46, 219-47, 296-50.  
**August** — W-181-51, 306-52, 307-53, 305-55, 304-56, 327-57, 317-58, 518-59, 330-60, 333-61, 302-62.  
**September** — W-352-63, 351-65, 370-66.

#### NEW POSITIONS OPEN

**Hydraulic Engineer**—Midwest farm-equipment manufacturer requires engineering graduate with 5 to 10 years' basic design experience in tractor-implement hydraulics. Must have proven ability to originate and design hydraulic systems. General knowledge of production equipment and methods helpful. Submit complete resume including salary requirements. O-395-144

**Agricultural Engineer** for design and application engineering on crop drying fans, heaters, in-storage drying structures, batch dryers, and other grain conditioning equipment with established manufacturer in Midwest. Age 30-35. BS in agricultural or mechanical engineering. Experience 5 yr. in crop drying design and application engineering. Must know farm practices in Midwest agricultural area. Considerable opportunity in farm engineering division. Additional opportunities depending on ability and company requirements. Salary open. O-405-145

**Agricultural Engineer** (assistant or associate professor rank) to have charge of agricultural power courses and research in power and machinery or processing. Teaching ¾, research ¼ time, with possible adjustment if desired after first year. Agricultural engineering department in a northeastern State University. Age under 40. PhD preferred. MSAE minimum requirement. Able to meet and work well with other professional and technical personnel. Experience in teaching power and machinery courses, or in research. Excellent opportunity for advancement. Exceptional retirement program. Also Social Security, group insurance and hospitalization. Working conditions superior to most. Salary open. O-408-146

**Agricultural Engineers** (several) for graduate research assistantships. Openings in all major fields of agricultural engineering. Research and graduate work for MS degree. Research program can be arranged to meet individual needs, desires and abilities. Northeastern state university. BSAE or equivalent with above average scholarship. Genuine desire for individual study and investigation. Openings effective immediately. Salary \$2,000 plus tuition. O-408-147

**Agricultural Engineer-Manager**, for manufacturer and installer of concrete pipe for irrigation and drainage systems. Western location. Age 30-40. Engineering and business education. Want resourceful leader, able to direct others. Unlimited opportunity. Salary \$600 to start. O-421-148

**Agricultural Engineer** for product planning manager for forage harvesting, handling, storage, and feeding equipment, with major manufacturer. Location, Canada. Age 30-50. BSAE or BSA, with major interest in machinery. Experience in contacting farmers, dealers, college and public agency personnel, and others with

farm related business. Proven judgment in farm machinery applications most important. Willing to travel up to ½ time. Excellent opportunity for advancement with large company. Salary, \$10,000 range. O-424-149

**Agricultural Engineer** to direct product development and improvement, field testing, and production planning with newly reorganized western manufacturer. Age 35-45. BSAE or BSME. Experience with manufacturer in similar work, preferably on tillage and materials handling equipment. Practical approach. Initiative and energy. Excellent opportunity for salary increase and profit participation in solidly financed firm with good product acceptance, established market, and good growth prospects. Salary \$9,000-10,000 to start. O-417-150

#### NEW POSITIONS WANTED

**Agricultural Engineer** for design work in power and machinery or farm structures with manufacturer, processor, consultant or farming operation in South or Midwest. Limited travel. Married. Age 28. No disability. BSAE 1960, University of Arkansas. Military service in Navy 8 yr. Experience since graduation nearly 2 yr. in design and construction of grain storage and dryer systems. Available on 4 weeks notice. Salary \$7,000-8,000. W-372-67

**Agricultural Engineer** for design, development, research or writing in farm structures field with manufacturer, processor, distributor or consultant preferably in Midwest. Married. Age 22. No disability. BSAE 1956, University of Illinois. Good farm background on progressive livestock and grain farm. Experience 6 yr. as engineer with prefabricator of wooden farm buildings and steel grain bins, including design of conventional and pole type structures, drafting, writing assembly instructions and technical sales literature, and cost analysis and pricing. Military service in Army 23 mo. Available Oct. 1. Salary open. W-414-68

**Agricultural Engineer** for extension, sales, service, writing, or farmstead engineering, in power and machinery, farm structures, or soil and water field with industry or public service. Northeast or Midwest. Willing to travel. Married. Age 33. No disability. BSAE 1953, University of Maine. Experience as field test engineer on harvesting machines 1½ yr.; county agent, farm structures field 1½ yr.; district supervisor of farm equipment sales to franchised dealers 1 yr.; SCS area engineer 2 yr.; advertising copywriter 2 yr. War enlisted service in Air Force 3 yr. Available on one month notice. Salary open. W-336-69

**Agricultural Engineer** for design, development, research or sales in power and machinery or electric power and processing with industry or public service. Any location. Married. Age 24. No disability. BSAE 1960; MSAE expected February 1962, Louisiana State University. Farm background. Summer work in drainage and irrigation with Soil Conservation Service. Design experience 9 mo. with major farm implement manufacturer. Licensed professional engineer. Available February 1962. Salary open. W-427-70

**Agricultural Engineer** for design, teaching, or research in product processing or other phases of Agricultural Engineering with college, experiment station, or federal agency. Prefer central U.S.A. but will consider any location. Married. Age 30. No disability. BSAE, 1954, Oklahoma State University. MSAE, 1959, University of Missouri. PhD expected June, 1962, Oklahoma State University. Farm background. Summer work with Soil Conservation Service and Farm Tractor Design Division, International Harvester Company. Three months with Farm Tractor Testing Laboratory of Allis-Chalmers Manufacturing Company after completing BSAE. Three years active commissioned service in USAF as a pilot and with installation engineers. Nine months as instructor at Texas Technological College. One year as graduate teaching assistant, University of Missouri. Two years as graduate research assistant, Oklahoma State University. Available February 1962. Salary open. W-430-71

**Gardner, Thomas E.**—Agr. eng. dept., University of Georgia, Athens, Ga.

**Jackson, Herbert L.**—Agr. eng. dept., University of Georgia, Athens, Ga.

**Leach, Eugene F.**—(University of Illinois) Lot 31, Tuck-A-Way Trailer Park, Metamora, Ill.

**Mickelson, Gene E.**—(University of Minnesota) 3840 17th Ave., S., Minneapolis 7, Minn.

**Reinkensmeyer, Earl O.**—(University of Illinois) 519 S. Perrine Ave., Centralia, Ill.

**Sanders, Charles R.**—(Auburn University) 1604 3rd Ave., N., Bessemer, Ala.

**Sutherland, James R.**—(University of Minnesota) 4036 Oregon Ave., N., Minneapolis 27, Minn.

**Thomson, Kimbrell A.**—(Mississippi State University) Aliceville, Ala.

**Ulmer, Ross L.**—(Purdue University) With U.S. Army. (Mail) R.R. 1, Pleasant Lake, Ind.

**Whitney, Richard W.**—(Kansas State University) 91 Blue Valley Cts., Manhattan, Kans.

**Wilson, David E.**—(University of Illinois) R.R. 2, Robinson, Ill.

**Wismar, Eli D.**—(Pennsylvania State University) Box 221, R.R. 2, Perkaskie, Pa.

## ... ASAE Members in the News

(Continued from page 560)

**Arthur H. Schulz**, extension agricultural engineer, North Dakota Agricultural College, has been named acting extension director.

**Delmar D. Fangmeier**, University of Nebraska agricultural engineering graduate, has been awarded a National Defense Fellowship at the University of California. This is a two-year fellowship for study leading to a Ph.D. degree in water resources engineering.

**James T. Walls** has accepted a position with New Idea Division of Avco Corp., Coldwater, Ohio, as project engineer. Formerly, he was associated with Interurban Industries as a project engineer.

**Lloyd A. Wakeman**, hydraulic engineer with the USDA Soil Conservation Service in Puerto Rico, recently has been transferred from Mayaguez to Santurce.

**Kenneth D. Grosse**, formerly field engineer for Caterpillar Overseas C.A., Brussels, Belgium, is now engine representative for Caterpillar Tractor Co., Ltd. of London, England.

**Carl H. von Wolfradt** has accepted a position of sales engineer with Sharpe Heating and Ventilating Inc., Los Angeles, Calif. Prior to moving to California he was located in Toronto, Canada, where he was a sales engineer with Air Products.

**H. E. Dobson**, formerly Washington manager, Food Machinery and Chemical Corp., Washington, D. C., is now located in Middlesex, England. He has accepted the position of managing director for Varley-FMC Ltd., a subsidiary of Food Machinery and Chemical Corp.

**James R. Hamilton** has joined the staff at Mississippi State University as professor of agricultural education. Previously, he was professor and head of the agricultural education department at Texas State College.

**R. C. Barnes, Jr.** is now located in Richmond, Va., where he is state conservation engineer with the USDA Soil Conservation Service. He previously was an agricultural engineer with SCS in Texas.

**Charles G. Burress** has accepted the position of general sales manager with Caldwell Mfg. Co., Inc., Kearney, Nebr. Formerly, he was eastern regional manager for Wonder Building Corp. of America, Harrisburg, Pa.

**Emil F. Carra, Jr.** has accepted a position as design engineer with the advanced engineering department, Tillage Division, International Harvester Co., Hinsdale, Ill. Formerly, he was a design engineer with J. I. Case Co.

**Harry J. Braud, Jr.** has accepted a position as associate professor in agricultural engineering at Louisiana State University, after completing requirements for a Ph.D. degree in agricultural engineering at Oklahoma State University.

**Ronald B. Jessop** advises that he has been appointed to the post of technical officer of land development on a Technical Assistance Mission of the United Nations to the government of Indonesia, under the auspices of the Food and Agriculture Organization of the United Nations. He formerly was located in Turi, Kenya, East Africa.

**Manuel Pallares** has been transferred by Massey-Ferguson Ltd. from Toronto, Ontario, Canada, to Coventry, England. His new position is that of agricultural engineer, publicity and marketing, for the Communications Division of Massey-Ferguson Ltd.

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# DIAMOND ROLLER CHAINS



The following bulletins have been released recently. Copies may be obtained by writing to author or institution listed with each.

*Underneath Understanding of Crop Drying Fundamentals*, by H. M. Marks and R. W. Dye. Electricity On The Farm Magazine, 466 Lexington Ave., New York 17, N. Y. Price, 75 cents. Quantity prices available on request.

*Comprehension of Graphs*, by L. E. Sarbaugh, Richard Powers, Hugh Culbertson, and Thomas Flores. Bulletin 31. January 1961. University of Wisconsin, College of Agriculture, Department of Agricultural Journalism, Madison, Wis.

*Eighth Edition of the Directory of the American Council of Independent Laboratories, Inc.* 1961. ACIL, 4302 East-West Highway, Washington 14, D. C.

*Distribution Patterns for Beef*, by Thor A. Hartsgaard and Sylvester D. Phillippi. Bulletin No. 435. June 1961. Department of Agricultural Economics, North Dakota State University, Fargo, N. D.

*Tips on Farm and Home Safety*, by A. M. Pettis. Bulletin No. 139. June 1961. Department of Agriculture, State of Florida, Tallahassee, Fla.

The two following standards are available from the Commodity Standards Division, Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C.:

*Recommended Industry Standard for Single-Hung Wood Windows*. No. TS-5474A.

*Amendment No. 1, Commercial Standard CS 188-59 — Cast Iron Soil Pipe and Fittings*.

*Achievements of Agricultural Science in the USSR*. Available in English. No 60-5199. Office of Technical Services, U.S. Department of Commerce, Washington 25, D. C. Price, \$1.25.

The two following bulletins are available from Food and Agriculture Organization of the United Nations, Viale delle Terme di Caracalla, Rome, Italy:

*Possibilities for the Utilization of Solar Energy in Underdeveloped Rural Areas*. Farm Power and Machinery — Informal Working Bulletin No. 16.

*Windmills for Water Lifting and the Generation of Electricity on the Farm*. Farm Power — Informal Working Bulletin No. 17.

The two following bulletins are available from the Agricultural Research Service, USDA, Beltsville, Md.:

*A Velvet-Roll Separator for Seed Testing*, by J. E. Hammond and N. R. Brandenburg. ARS 42-53. July 1961.

*Some Spray Distribution and Atomization Tests with a Helicopter*, by D. A. Isler and Bohdan Maksymiuk. ARS 42-54. September 1961.

*Protection of Rail Shipments of Fruits and Vegetables*, by W. H. Redit and A. A. Hamer. Agriculture Handbook No. 195. July 1961. Superintendent of Documents, U.S. Government Printing Office, Washington, 25, D. C. Price, 55 cents.

*Agricultural and Horticultural Engineering Abstracts*. Vol. XII, No. 3. 1961. Ab-

stracts Nos. 891-1358. Scientific Intelligence Unit, National Institute of Agricultural Engineering, Wrest Park, Silsoe, Bedfordshire, England.

*What Water Means to Ohio*. Department of Natural Resources, Ohio Water Commission, 1562 W. First Ave., Columbus 12, Ohio.

*10-Year Paint Tests on Weathered Galvanized Roofing*, by A. J. Muehling and J. O. Curtis. Bulletin 676. August 1961. Agricultural Engineering Department, University of Illinois, Urbana, Ill.

*Educational and Academic Research Facilities in Ground-Water Geology and Hydrology in the United States and Canada*. Prepared by the Research Committee of the Technical Division of the National Water Well Association. May 1961. National Water Well Association, P.O. Box 222, Urbana, Ill. Price, 25 cents.

The seven following test reports are available from the Institute of Agricultural Engineering, Wrest Park, Silsoe, Bedfordshire, England:

*Wallace "J. F." Manure Spreader*. No. 277. March 1961.

*Nuffield Universal Four Diesel Tractor (Farm Trials)*. No. 278, April 1961.

*Lister Blackstone Potato and Beet Elevator*. No. 279. March 1961.

*Ideal Rothery Grain Cleaner — MK 2B*. No. 280. May 1961.

*"Wright Rain H3" Tractor Mounted Pump with Flanged Outlet*. No. 281. August 1960.

*Ransomes Rotary Slasher*. No. 282/EA. April 1961.

*Massey-Ferguson Model FE-35 Diesel Tractor with 3 A. 152 3-Cylinder Engine*. No. 283/OEEC. June 1961.

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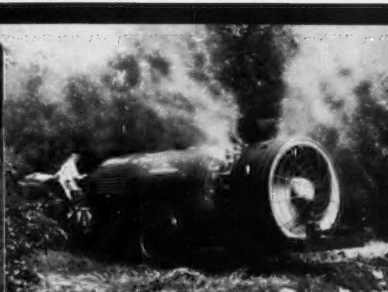
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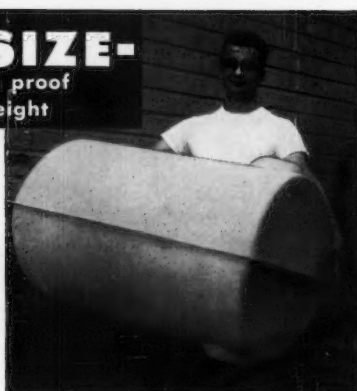
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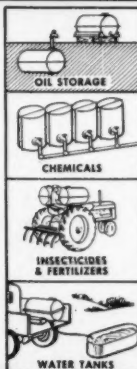
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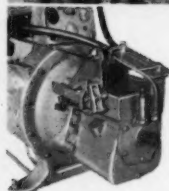
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## News

(Continued from page 559)

M. G. Bekker, Defense Systems Division, General Motors Corp., Box T, Santa Barbara, Calif.

### Eisenhower Is 21st Hoover Medalist

Dwight D. Eisenhower, who in 1957 was elected an Honorary Member of ASAE, has been awarded the 1960 Hoover Medal. The citation given in honor of Mr. Eisenhower reads, "History records the leadership in world peace which Dwight David Eisenhower has given to all people in preparing and directing undertakings of monumental engineering dimensions in military and civilian operations of great magnitude and far reaching significance. As an organizer, leader, and our President, he has throughout his illustrious career given proof of the importance of the individual by the impact of his actions in building a better world for people everywhere."

The Hoover Medal, founded in 1929, was instituted to commemorate the civic and humanitarian achievements of Herbert Hoover, and the first award was made to him in 1930. The Medal was founded and perpetuated by the trust fund established by Conrad N. Lauer of Philadelphia and has been awarded 21 times. It is held by the American Society of Mechanical Engineers and is administered by the Hoover Medal Board of Award consisting of representatives of the four national societies — the American Society of Civil Engineers; the American Institute of Mining, Metallurgical, and Petroleum Engineers; the American Society of Mechanical Engineers; and the American Institute of Electrical Engineers.

## New Products

(Continued from page 568)

porosity, not alone from impregnation with copper and zinc but also from a new die-casting process. It is also reported that the new alloy provides a good bonding with cast iron for use in aluminum engines with cast iron liners.

### Flexible Steering Link

Stow Mfg. Co., 39 Shear St., Binghamton, N. Y., has developed a new flexible shaft core especially designed as a steering link for the steering column of vehicles such as automobiles, trucks, and tractors. The flex-



ible shaft core is made of top grade music wire and is available in  $\frac{3}{8}$  or  $\frac{1}{2}$ -in. sizes. Steering columns of this type can be deflected sideways 20 deg or more depending on the length.

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High sensitivity and positive reliability are important factors in temperature controlled agricultural applications. You get *both* — plus maximum durability — by specifying a Fenwal THERMOSWITCH Unit!

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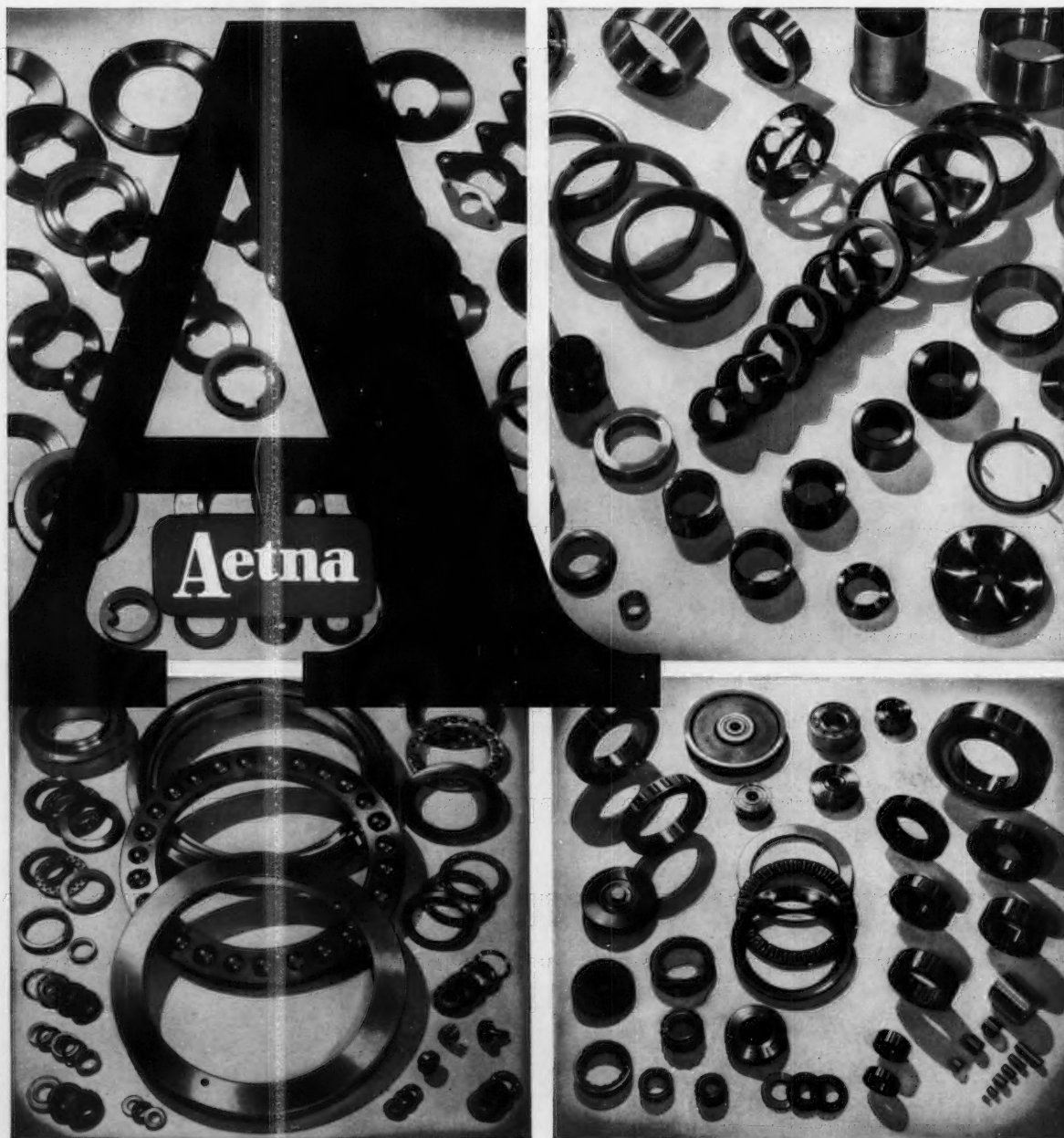


Another example of how

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CONTROLS TEMPERATURE...PRECISELY

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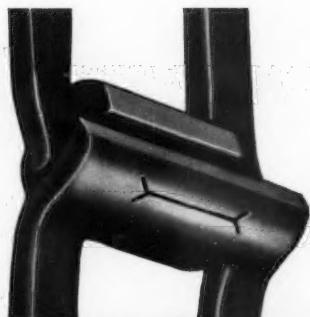


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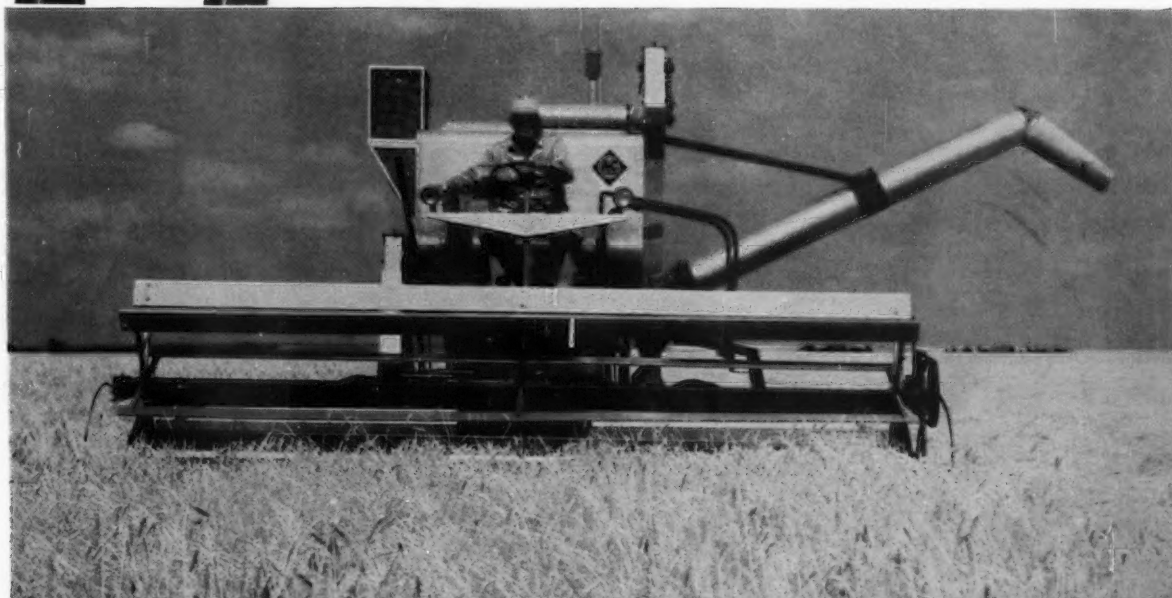
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## LINK-BELT drive and conveyor chains

# travel with the leaders



THE GLEANER-BALDWIN SELF-PROPELLED COMBINE, built at the Allis-Chalmers, Independence, Mo. Works, is equipped with Link-Belt precision steel roller chain, double pitch "AG" roller chain and steel detachable chain for drives and conveyors. Link-Belt augers are also used for conveying.

### Over 300 quality-conscious farm machine manufacturers rely on Link-Belt for chain...and bonus services besides

If you want chain that's the efficiency-equal of your equipment, join the more than 300 leading manufacturers who go with Link-Belt. Experience has shown them that the refinements built into Link-Belt chain make a vast difference in field performance, help assure customer satisfaction for their machines.

Steel Link-Belt chain, shown at left, is lightweight, strong and low-cost. Its open hook design simplifies coupling and uncoupling. And like *all* Link-Belt chains it has consistent quality and uniformity in every link.

Link-Belt offers industry's most complete line of drive and conveyor chains, conveyor chain attachments and sprockets. Also, "bonus" services: application counsel, field analysis, laboratory service and others. These services multiply the *value* of Link-Belt chains, *but not the price!* Contact your nearest Link-Belt office or the Indianapolis plant at 220 S. Belmont Ave. Ask for 640-page Catalog 1050.

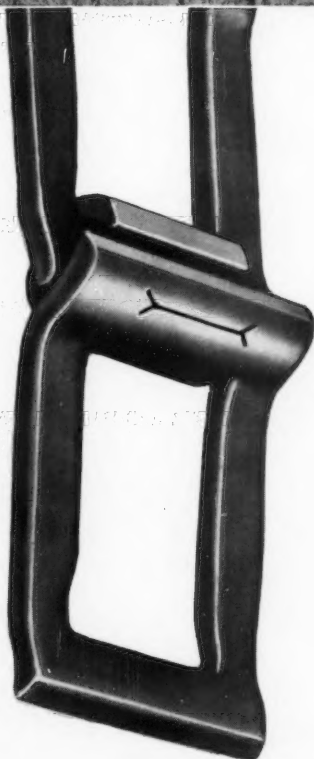
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